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R. H. STINCHFIELD, *Managing Editor* SID NOBLE, *Editor*

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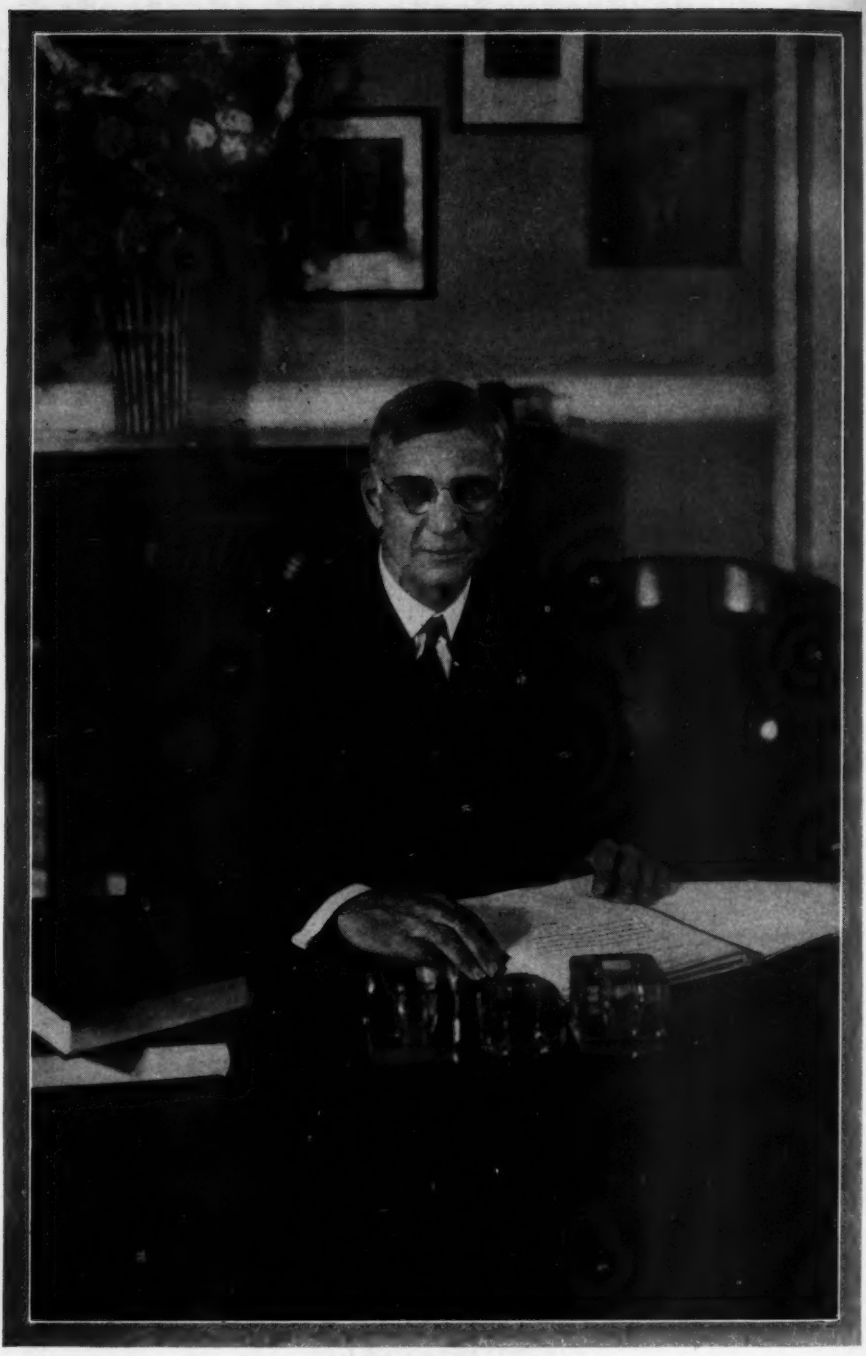

Arthur Mastick Hyde

The new Secretary of Agriculture comes to his important duties well equipped with experience as former Governor of Missouri, able farmer, and business man.

Better Crops with Plant Food

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Vol. XII NEW YORK, APRIL, 1929 No. 4

Call it April,
Spring Fever, or

Ennui

By Jeff McDermid

IT is the parlor word for languor or laziness, depending upon whether you are poetic or prosaic, rich or otherwise, French or Yankee.

It is a perfectly good legitimate mood for professional neurotics, hotel clerks, telegraph boys, and old maids. It is indigenous to fat men and hot climates and is responsible for more "grandmothers' funerals" than the chiropractor. It has ruined more resolutions and league standings than John Barleycorn, and is more popular with congressmen than farm relief.

Ennui is East and Pep is West, and ne'er the twain shall meet. In the North it follows a hard winter and an empty pork barrel, while in the South it goes with mint julep and is an inherited privilege.

It is the cause of idle conjectures in lieu of constructive thoughts, as for instance such as these:

If a fellow figured out the barrels of liquor consumed in a year the result would be staggering.

If you are interested in antique furniture count the wooden knobs on the president's cabinet.

Why did I pay the ice man ten dollars in arrears and then hire a roofer to knock an icicle avalanche off my gables for twenty dollars in cold cash?

Why do insurance men keep tab on your age when you'd like to forget it?

What does a tax bill feel like when

it is delinquent?

Sundry cogitations of no consequence give vacations to our overwrought cerebral processes. Hence ennui is a boon to us whose privilege it is to enlighten the world—and fill the wastebaskets.

After all, it may be a boon to exist in a mental vacuum. Some of my old friends in the asylum tell me it is, and await my capture with suppressed emotion. They envy my large circulation and wonder how much longer I will be able to deceive the world and retain my liberty. Strange to relate, one of those inmates has invented perpetual motion in the midst of his ennui, and still another has found food for thought in the congressional record. I expect to apply there for a chance at the simple life during April —the month of great expectations.

APRIL! Month of good hopes, fair poetry, and bad roads. The season of rug beating, floor scrubbing, and postponed homecomings. The returning time of the birds, the pedler, and the rejected manuscript. Taps for the coal man and reveille for all manner of summer brigands. The interval between winter zest and the discarded vest. The interlude between fur coats and beach disclosures. In April who can be sane without ennui anyway?

As I intimated heretofore, why *be* sane? It is un-American, perhaps unpatriotic—and least *declasse*. You'll get no more lucrative employment at least in *my* line by virtue of sanity, and all the world is headed the opposite way anyhow—all but yourself! Why persist in being dull and practical, mathematical and obtuse, involved and enigmatic, ambiguous and drabbily consistent? For once be a darned radical and go barefoot with a rag on your big toe and a patch on your pants!

Take Diamond Dick, Wordsworth, and Keats, pack along the jug of home-made, and slice the loaf under Omar's bough! Hunt for dandelions, pussywillows, and fish-worms, but don't bother about cooking the greens, filling the vase, or baiting the hook. Hate school hours, chores, and girls as of yore, and find content in a world made to order for men and liberty! Try this for half an hour and see how nice it seems to regain consciousness.

I haven't tried it myself for almost thirty years, but why need you be a failure likewise?

Ennui and inertia are *not* the same. True, ennui suggests repose, but I know absent-minded men who are very active physically, and many a hustler after all is inert when it comes to accomplishment.

Ennui is a temporary disorder or a mental relaxation, as you please; but inertia is a veritable disease of stagnancy. A dose of ennui hurts no one and helps a heap betimes, while chronic inertia is the perpetual gumbo on the prairie schooner of progress.

Cultivate ennui but eradicate inertia; but don't get them mixed!

Americans are at fault because they fail to sense this vital difference between the two states of mind. If Frenchmen invented ennui, they performed a service that will outlive their salads and snappy stories.

Americans are often pitiful when they imitate the European or Canadian in fits of luxurious languor. We eat tea and toast at seven A. M. but never at the office. We are always on the go but never arrive. Our callers in work hours never hang up their hats or nestle comfortably for a chat —if they do, we despise them! We pay others to play for us and pray for us, but we can't hire someone to rest for us! "Better to wear out than to rust out" and "he died in the harness" are our enterprising ideals. Who said we don't need ennui, anyway?

Of course, there are different kinds of ennui, but I refuse to endorse them all. The best way to get a slant at this is to imagine a hotly contested

(*Turn to page* 61)

24 Tons *of* Tomatoes

Is a Big Yield for One Acre

By E. R. Lancashire

Extension Specialist, Ohio College of Agriculture

HOWARD HARPER, of Indiana, might well be called a "Tomato King," for he has produced a yield of 24 tons of tomatoes per acre. That this yield was not a matter of chance is an established fact. In the same field, other acres produced at the rate of 20 tons, while still other acres produced at the rate of 16 and 17 tons per acre.

The way Harper jumped the yields from 16 to 20 and finally up to 24 tons per acre is a story of the employment of good tomato growing practices plus the use of additional applications of potash.

That Harper is a real tomato grower can be understood by his reaction to the high yield made by the state winner in Indiana's "Ten Ton Plus Tomato Club." He called upon the writer one winter day and brought with him the canning factory operator with whom he did business. After the usual get acquainted conversation which takes place between the agricultural extension men and the men who operate the farms, Harper began his story somewhat in this way:

"About 50 miles east of here I am operating a farm. Part of it is usually in tomatoes for the canning factory.

Mr. Harper receiving a $110.00 gold watch presented by E. R. Lancashire for the "Ten Ton Plus Tomato Club."

The tomatoes on the left represent the high potash plot. Those on the right represent the 2-12-12 plot.

For several years now my yields have been in the neighborhood of 10 tons per acre.

"I noticed in our paper that you folks at the college are putting on a tomato growing contest. I noted also that my yield of last year was more than that of the high yield man in the club.

"Our trip here today is for the purpose of getting into that contest. We want all the information there is on the tomato growing game. Some one will have to step right out if he beats us next year."

By "us" Harper referred to himself and his son. His prophecy was fulfilled. Harper and his son won the contest and received a fine gold watch as a reward for their efforts in addition to a cash bonus of several dollars. Harper received all that he asked for and something in addition.

This something in addition which the Harpers received was an invitation made some months later when their willingness to cooperate was well established. The invitation was one dealing with a fertilizer demonstration which the Horticultural Department of Purdue University wanted to try.

Experiments extending over a three-year period showed that potash was usually deficient on the black rich-looking soils of Tipton county, Indiana. The question was how much potash was profitable on such soils.

Accordingly, one of the fertilizer companies was invited to mix up some special goods. The standard recommendation of the "Ten Ton Plus Tomato Club," is 500 pounds of a 2-12-6 fertilizer applied broadcast just before the tomatoes are set in the field.

Three special mixed fertilizers were made for Harper. They were a 2-12-8, a 2-12-12, and a 2-12-16.

These special fertilizers were put on broadcast at the rate of 500 pounds per acre and were worked into the upper two inches of surface soil just before the plants were set to the field. A part of the tomato field was laid off into three plots. These plots were long, about one-half the length of the field. The width of each plot was about 40 feet.

No attempt was made to obtain experimental evidence as the experimenter would look at the problem. The three plots of exactly the same size and treated exactly the same in every way, except that of the fertilizer analysis used, were laid out for demonstrational purposes. Harper kept track of the number of boxes of fruits picked and the dates of each picking made.

Difference Noted Early

Early in the season a difference in vine appearance could be noted by Harper and the several people who knew about the demonstration. This vine development continued to be distinguishable right up to harvest time. The first pickings were made on the plot which received the 500 pounds of a 2-12-16. So earliness of ripening was one of the first results obtained. The plot which received the 2-12-12 was second in the matter of time of picking.

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RHODE ISLAND

Experiment Station

By *Basil E. Gilbert*

Kingston, R. I.

THE General Assembly of Rhode Island in 1863 passed resolutions authorizing the Governor to accept the landscript (120,000 acres in Kansas under the Congressional "Agricultural Land Grant Act") and to transfer the same to Brown University at Providence. The income from the $50,000 received for the land was used for scholarships until the principal was transferred to the College at Kingston in 1894.

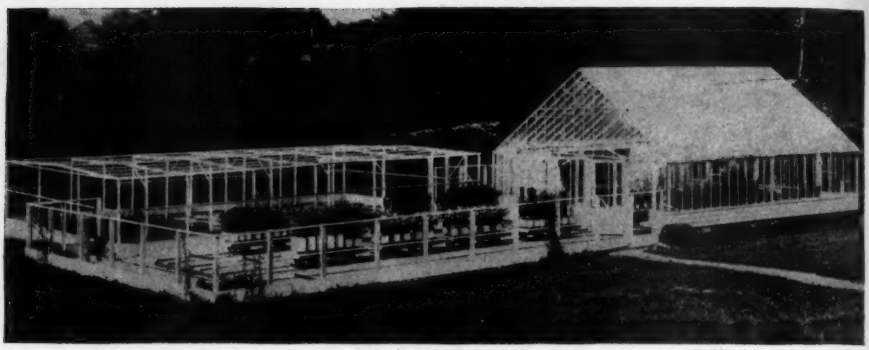
On March 23, 1888, the Rhode Island Legislature passed an act establishing a State Agricultural School on an independent basis. The township of South Kingston and citizens of the village of Kingston therein having each donated $2,000, it was decided to locate the School and Experiment Station at Kingston. The State Agricultural School soon became the Rhode Island College of Agriculture and Mechanic Arts and later the Rhode Island State College.

Charles O. Flagg was Director and Agriculturist of the Station until November 1, 1897. He was succeeded by Doctor Arthur A. Brigham who occupied the positions until September, 1902. Doctor Homer J. Wheeler was appointed Director to succeed Doctor Brigham, and placed in charge of field experiments, to be later given the title of Agronomist in 1904. Doctor Burt L. Hartwell succeeded Director Wheeler as Chemist in 1907 and as Director and Agronomist in 1913. He served in these capacities until 1928. Doctor Basil E. Gilbert was appointed Director and Plant Physiologist in February, 1929.

Basil E. Gilbert, Director, Rhode Island Experiment Station.

Previous to the increase of Federal funds following the passage of the Purnell Act in 1925, the main activities of the station were confined to production problems. Crop and soil relations under field and greenhouse conditions along with studies on diseases and inheritance of poultry formed the outstanding interests of the station during this time.

In connection with the agronomical research of the



Summer Vegetation House, Rhode Island Agricultural Experiment Station.

Rhode Island station, chemical researches and glass-house investigations have, for many years, been closely associated with field experiments. A few of the more outstanding lines of investigation in which progress has been made may be of interest.

Although American literature had recognized that very wet soils or peat or muck might be acid, it remained for the Rhode Island station to recognize in the early nineties the fact that upland, well-drained soils were liable to be even strongly acid and to respond to alkaline materials.

Alumina and Soil Acidity

The difficulty and one remedy was thus early recognized but that active alumina itself was a potent toxic factor in acid soils was not known until the discovery was published at the Rhode Island station in 1918. The deleterious effects of aluminum salts had been recognized elsewhere but not that these effects were attributable to the alumina part of the salts.

The relative toxicity of alumina to different crops was found to be similar to the relative effect of acid soils containing active alumina, and this seems to be the principal deleterious factor in such soils inasmuch as abnormally large applications of superphosphate temporarily conditioned the soil without reducing the acidity. Phosphoric acid, used liberally in addition to lime, is now recognized as a desirable second antidote to use in conditioning soil for crops which are highly sensitive to acid soil containing active alumina.

Plant chlorosis had been recognized for years when sufficient lime was used to neutralize all of the acidity; this was later found to be due to a lack of available manganese, hence the desirability of only reducing to a low point the acidity by the use of an alkaline antidote such as lime and the completion of the conditioning by a carrier of phosphorus as an additional antidote.

Under highly acid-soil conditions it was found that mangels, cabbages, rutabagas, and buckwheat exerted an outstanding deleterious effect on crops sensitive to such soil conditions; for example, in 1910, even though the onions were liberally fertilized, the yield varied from 72 bushels following mangels to 524 bushels following redtop. It was found later that the deleterious crops had a highly alkaline ash and that their removal increased soil acidity and aluminum activity. Furthermore, increasing applications of superphosphate decreased markedly the ash alkalinity.

It was shown that the addition of alkaline materials till the soil was only slightly acid, and an accompaniment of liberal applications of phosphorus carriers, so conditioned the soil that well fertilized preceding crops were no longer deleterious to even highly sensitive followers.

Only after a soil has been put in condition in other respects, should attention be given to fertilizer for nutrient purposes. The quantity of each fertilizer nutrient required has been found to depend on the crop plant to be grown as truly as on the soil. Therefore the relative response of different crops to each of the three fertilizer nutrients is as fundamental to fertilization as similar information concerning response to alkaline materials has proved fundamental to liming.

Crop plants, including pomological ones, are being divided into low, medium, and high response groups in respect to each ingredient which has been mentioned.

Owing to the scarcity of horse-stable manure, attempts are being made to maintain the necessary organic matter in market-garden relations by the use of green manures, compost, and peat.

Extreme differences have been manifest between early cabbage which has needed no manure and late celery which has not been grown successfully with the lesser amount of organic matter from the green manure. Relatively then the cabbage appears to be in the low response group and the celery in the high response group to organic matter.

Throughout the state many cooperative field tests and considerable chemical work has been done to determine the lime and nutrient needs of different soils.

Fertilizer Studies

The availability of the fertilizer ingredients in nearly all commercial carriers, and the effect of the associated ingredients on the soil have been determined. For example, the commercial carriers of potash are used under such conditions that there is an opportunity given for the effects of not only potash but the associated sodium, magnesium, chlorine, and sulphur. Sodium has been shown to be markedly effective with many crops when there is not sufficient potash.

Weedless lawns have been maintained by taking advantage of the discovery that bent and fescue grasses compete successfully with weeds under highly acid-soil conditions. Such conditions are maintained or created

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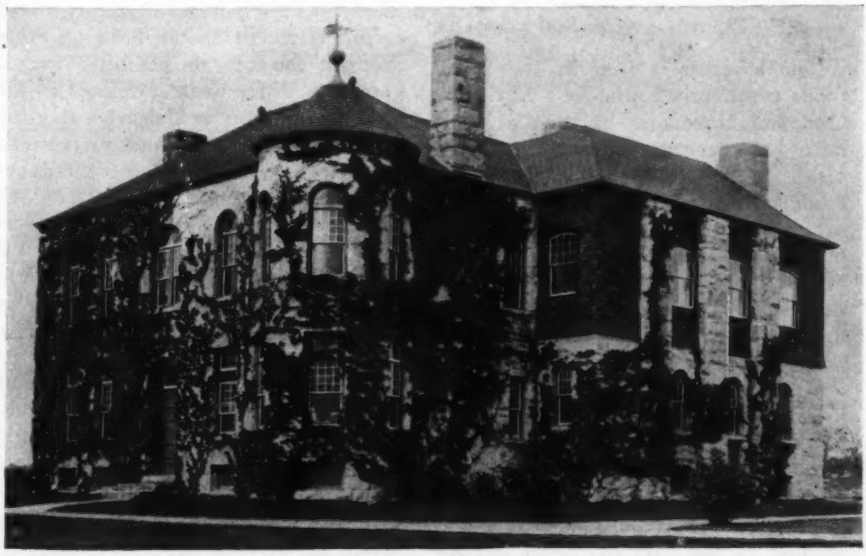

Original offices and chemical laboratories, Rhode Island.

More Soybeans

By O. E. Ackerson

Jacksonville, Illinois

THE soybean seems destined to occupy an increasingly important place in the cropping systems of the Midwest, because of the many economic advantages in favor of its production. The acreage of soybeans has increased more rapidly than any other field crop in Illinois in recent years. In 1914 the State harvested about 2,000 acres for all purposes. In 1927 the acreage increased to 776,000, of which 419,000 acres were planted for seed and hay, and 357,000 acres were planted for pasture or silage with corn or other crops.

The increased interest in the crop has created a demand for information on the fertilizer needs of the crop, methods of application of fertilizers, the value of the soybean as a soil builder, and the effect of the soybean on other crops in the rotation.

Draws on the Soil

The soybean is rich in the plant foods commonly found in a fertilizer. One and three-fourths tons of soybean hay per acre is a conservative yield. This tonnage of hay contains 89.6 pounds of nitrogen, 23.8 pounds of phosphoric acid, and 81.4 pounds of potash, according to Henry and Morrison. It is evident that the crop uses large amounts of nitrogen and draws heavily upon potash.

Soybeans grown on the University of Illinois Experimental Field at Odin have received a basic treatment of residues, limestone, and bone meal. On adjoining plots this treatment has been supplemented with potassium sulfate. The limestone has been applied at the rate of 1,000 pounds per acre annually, the bone meal at the rate of 200 pounds per acre annually, and the potassium sulfate at the rate of 100 pounds per acre annually. The increased yields of the combination with potash over that without are shown on replicated plots over a period of years.

Increase of Plot	1927 Seed Bu.	1926 Hay Tons	1925 Hay Tons	1923 Seed Bu.
5 over 4	12.7	.49	.33	5.0
10 over 9	8.5	.21	.02	2.7

The soil type at Odin is a gray silt loam on tight clay.

The photographs of the soybeans on the Odin Field taken July 26, 1928, show the height and appearance of the crop shown on the residues, limestone, and bone meal treated plot, compared with the crop on an adjoining plot receiving the same treatment plus potassium sulfate.

The effect of the soybean on other crops in the rotation has been investigated by different stations. On the University Farm at Urbana a rotation of corn, corn, corn and soybeans is grown. The first-year corn after soybeans has averaged about 10 bushels higher than the third-year corn after soybeans. The yield of corn on the Morrow plots at Urbana is 10 bushels higher in the corn and oats rotation than where corn grows continuously. Whether the increased yield of corn after soybeans is due simply to a change of crops or to some other factor is not known.

In the Rotation

There has been some complaint about the soybean affecting a succeeding wheat crop unfavorably. Some

These soybeans received only residues, limestone, and bone meal. Compare the height of growth with the man.

Ohio results throw light on this point. With the same soil treatment in 12 rotations the average yield of wheat after corn was 35.5 bushels an acre. In 6 rotations the average yield of wheat after potatoes was 40.2 bushels. In 6 rotations the average yield of wheat after soybeans was 33.3 bushels. In 3 rotations the average yield of wheat after oats was 37.9 bushels. In one rotation the average yield of wheat after clover was 40 bushels. All wheat yields above are 9-year averages. The soybeans were grown for grain in the above rotations.

The first crop of wheat following a change from soybeans for grain to soybeans for hay resulted in 15 per cent larger yields following hay soybeans. In 1928 there were 170 per cent greater yields of wheat following hay soybeans than when following grain soybeans. This indicates that the earlier seeding of wheat made possible when the beans are harvested for hay has an influence on the yields of wheat.

The University of Illinois has found that wheat after soybeans yielded more than wheat after corn, and the same as wheat after sweet clover on land fertilized with superphosphate, while on untreated land, wheat after soybeans yielded the least.

In addition to the same treatment as above, these soybeans received potash. Note that the growth reaches the man's waist.

If wheat does not yield quite as well after soybeans as after other crops, the difference may be offset by less costly seedbed preparation for wheat after soybeans. Oat stubble is usually plowed for wheat, but wheat is often drilled on soybean stubble without any preparation, or by simply disking ahead of the wheat drill.

Ohio investigations show that about nine-tenths of the soybean plant is found in the top and one-tenth in the roots. If the entire crop is removed and none of it returned as animal manure or green manure, the soybean although inoculated would not increase the nitrogen supply. Inoculated legumes secure about one-third of their nitrogen from the soil and two-thirds from the air. Hence when the entire crop is removed, clover is more valuable for soil improvement than the soybean.

Fouts Brothers of Camden, Indiana, owners and operators of Soyland Farm, report the profitable use of fertilizers on soybeans, using both row and broadcast applications. In 1928 an 0-28-12 analysis was used. They say the analysis of the plant indicates that it needs as much phosphate as the average farm crop and much more potash. They have found that soybeans are more sensitive to fertilizer in the hill than most farm crops, and suggest that heavy applications should not make direct contact with the seed.

High Feeding Value

The rapidly increasing acreage of soybeans is proof of the advantages of the crop over some of the common farm crops. The high feeding value of soybeans, both hay and grain, has caused many farmers to place them permanently in their rotations, and others to grow them whenever other legume hays fail. Soybean grain is the richest protein grain, and soybean hay is the richest protein roughage produced on the farm.

One of the chief limiting factors in the economic production of livestock on corn belt farms has been and still is the feeding of rations too low in protein. Wise feeders have been buying high protein feeds such as tankage, linseed meal, cottonseed meal and other concentrates to balance the high-carbohydrate farm grains. They will continue to buy such feeds, as mixtures of various protein feeds have been demonstrated to be more profitable than single protein feeds, but the same quantity will not need to be bought by those who supplement their rations with the single-season farm grown soys.

For All Animals

Leading soybean growers including the Meharry Farms in Illinois and Indiana, and the Fouts Brothers' Farms, Camden, Indiana, believe that the most profitable way to use soybeans is to feed them. The horse, cow, hog, sheep, and hen can use the soybean or some soybean product in their ration to good advantage. However, there are other promising outlets. Commercial companies have built several soybean processing plants for the production of soybean oil and soybean cake or meal. Companies located in Bloomington and Peoria guaranteed growers $1.35 per bushel f.o.b. their plants for the 1928 crop. Owing to the increasing acreage of beans, the seed outlet has been profitable to those equipped to reclean and grade soybeans as demanded by the seed trade.

The soybean has an advantage over alfalfa and clover in that it will grow on soils too acid for the successful production of the latter crops. The soybean is adapted to a wide range of soil types, but like other crops, develops best on fertile soils.

Soybeans fit well into the rotations of Midwest farmers and furnish a satisfactory substitute for oats, the market for which has been dwindling with the reduction of the horse population.

Jupiter Pluvius—*Thief*

By D. Scoates

Agricultural and Mechanical College of Texas

"OUR soil fertility losses are greater from erosion than from all the other causes put together," is the verdict of a group of scientists who have been studying this problem in Texas for the past several years. Most of those interested in agriculture have not as yet come to the realization of just how great this loss is.

A typical example of how little it is appreciated was brought out by the attitude of this group of Texas agricultural research workers when they were setting up an experimental project in western Texas to discover the amount of water that ran off or that was lost to the land on which it fell. This group of workers were setting up what is possibly the largest runoff water project in a country where the average annual rainfall is 21½ inches, and where moisture is the limiting factor in crop production.

While discussing these projects, they decided that the question of soil erosion, as far as this section of the country was concerned, was of minor importance and it possibly was very little. Fortunately, however, they decided to check up on it in order to know exactly what it was and be in position to say definitely that it was of no importance.

Imagine their surprise when at the end of the first year they found that there was loss on one piece of soil at the rate of 41 tons per acre and this with only 27½ inches of rainfall and a slope of only 2 feet in 100 feet. If such losses occur in places with so small a rainfall and on such flat slopes, what must the losses be in sections of higher rainfall and steeper slopes?

Fortunately, we have some authentic information along this line because the Missouri Agricultural Experiment Station has been checking up on their soil losses by a system of small plats which have an average slope of 3.68 feet per 100 feet. This project has been in operation for 10 years. The data for the first 6 years is all that is available and it shows that during that time the mean annual rainfall was 35.87 inches. On the plat which was uncultivated and kept clean of weeds and vegetation, the average annual loss was at the rate of 34.6 tons per acre; or putting it another way, this land would lose 7 inches of its top soil in 29 years.

There is a similar project at the North Carolina Agricultural Experiment Station, where the slope is 10 feet per 100 feet with an annual rainfall of 45 inches. I am informed that although they have not published any data on the subject, they have had an annual loss which checks very well with the results from the other stations.

Naked Land

It must be admitted that absolutely naked land is in the minority as far as acreage goes, but it must not be forgotten that there are large acreages which are void of any vegetation. Particularly is this true in the badly eroded sections where the top soil is gone, leaving only the unfertile subsoil exposed.

The slipshod methods used on thousands of farms where the rows are run up and down the slopes, the seedbed

Here a terrace is being constructed to carry water off from the adjoining fields.

is shallow, and no system of maintaining soil fertility is pursued, have resulted in almost as great a soil loss from erosion as there is from the naked land. This is borne out by the first year's results of the experiment at Spur, Texas, where land planted in cotton on a 2 per cent slope had a soil loss of almost 28 tons per acre, with a 27½-inch rainfall. The Missouri Station found that their soil loss on land continually cropped with corn, was at the rate of more than 16½ tons per acre. Comparatively speaking, a very small per cent of the land farmed throughout the South and Midwest, where soil erosion is a problem, is farmed with any attention to the reduction of soil losses.

The magnitude of our soil losses can best be shown by the large amount of silt carried by our rivers. The Mississippi River transports annually into the Gulf of Mexico over 406 million tons of silt. The Potomac River empties annually 5½ million tons of silt into the Atlantic. Blaney and Fortier are authority for the statement that the Colorado River, which runs through Colorado and down into California, and on which the much disputed Boulder Dam is to be placed, and which has a drainage basin as large as the state of Texas, is carrying away annually over 253 million tons of silt.

It is not only the loss of this silt from the watershed that is a grave economic problem, but it is the handling of it after it gets into the stream. It brings on many serious troubles. If the stream had a constant rate of flow and a straight path, the silt would go on down to the sea and be placed on its bed. There are, however, different slopes to the stream beds, as well as various crooks and turns, which change the rate of flow. As the silt carrying capacity of a stream depends on its velocity, when there is a change in velocity, it immediately changes the carrying ability, with the result that some of the silt is dropped. This means the forming of bars and the filling up of the river channel, which necessitate clearing the silt out of the channel if it is to carry the drainage that comes to it.

Loss of Soil Fertility

Most of our large rivers are now taxed to the limit, due to the fact that drainage in all sections has been improved. River flood plains have been encroached upon, forcing the rivers to

stay within their channels when previously they were allowed to spread out over large areas of bottom land.

So the soil loss which is a tragedy in itself, in that it is lowering the fertility of our soils and thereby reducing our crop yields, which in turn spells unprofitable farming, is not all the story. We have lost this heritage given to us and it goes down through the streams of our country only to cost us additional wealth in getting it out of the streams in order to prevent catastrophes to people in all walks of life.

It has been felt for some time that where this silt gets into irrigation water, instead of being a menace, it is a blessing. This is by no means always the case. The problem of the irrigation engineer in building his canals and constructing his large reservoirs is always how to handle the silt if he is dealing with a muddy stream. Fortunately, the engineer is becoming adept in improvising ways and means by which he can dispose of this silt as it accumulates in places which will decrease the efficiency of his irrigation works. But at best, these systems of handling are very costly and in many cases are only partly successful.

The idea that the silt when it gets on to the land through irrigation water is beneficial, in that it is continually depositing a new wealth of soil fertility, does not always hold true. A number of years ago, I was talking to the then superintendent of the State Agricultural Experiment Station in the Imperial Valley in California. We were discussing the raising of cotton, and I asked him what he did about his soil fertility and what rotation he followed. His answer was that soil fertility did not worry them because the Colorado River was giving them, through the silt in the irrigation water, more fertility each year than they could hope to exhaust. That was a number of years ago and today the Imperial Valley has awakened to the fact that there are many disadvantages in that silt which more than offset its fertility. It is ruining the mechanical condition of their soil. The result of all this is that they are now very much concerned about how they can get the silt out of the water and not put it on the land. According to Fortier and Blaney the average annual cost of silt disposal and control in its various forms in the Imperial Valley Canal is about one million dollars.

Soil fertility losses from this soil erosion cannot, of course, be estimated accurately in dollars and cents. Ben-

Showing how a well-constructed terrace will carry off the water gradually.

nett, of the U. S. Department of Agriculture, says that soil erosion takes from the farmers' pockets an annual toll of at least two hundred million dollars. He goes on with the statement that he believes he is very conservative and that this estimate is moderate. There is no doubt that the loss is tremendous and as we have said before is not fully appreciated by the rank and file of those interested in agriculture.

We are finding, however, that it is becoming a very popular subject of talk by leaders in our affairs of the world. Business men and bankers also are coming slowly to the realization that something is wrong because the production of our farms is not what it used to be. In thinking of the solution of the problem, these men do not have to be very keen observers when they go out through our agricultural section to see that the top soils of our very fertile fields have migrated to lower elevations.

The Banker's Concern

The banker usually is cautious in taking up new systems and new ways of doing things. I do not know that he is different from other folks in this respect, but because he so materially affects the business of people in all walks of life, we perhaps particularly notice his conservativeness. These men who hold the purse strings of the country are just waking up to the great economic loss which soil erosion is causing the country. They had to have this fact brought home to them in a most forceful way before they took action to prevent it as far as they could. When we realize that the yearly loss from cultivated land, when not properly treated, can be at the rate of say 16½ tons per acre, it only takes 32 years for the upper 4 inches of that soil to be gone. When that 4 inches goes, it is practically the farm because it is the productive part of the farm.

If a banker has a mortgage on the farm, and the land was worth $100 an acre when he started, and this mortgage was at the rate of $50 an acre, and if the time of the mortgage is 40 years, he wakes up when this mortgage becomes due to find that he has lost his farm. The thief is Jupiter Pluvius. He can swear out a warrant for this person, but the trouble with it is that the sheriff cannot serve the warrant and no jail can house the criminal. The farmer who lives on the land, of course, was negligent in allowing the crime to be committed, but if he is that kind of an individual, it does not do the banker any good.

At least one bank has awakened to this fact and that is the Federal Farm Loan Bank of Houston, Texas, with the result that they have incorporated in the papers they have issued on the loan that the farmer must terrace and drain his land properly so as to keep the collateral in good shape. If at any time the bank does not think this is being done properly, it can call the loan.

This seems to me to be one of the most outstanding developments in recent years towards enforcing protection of the fertility of our soils.

What Can Be Done?

What methods can be employed to eliminate absolutely this soil erosion? I do not believe we are far enough into the study as yet to be able to dictate a policy which will absolutely eliminate all soil erosion. However, we can go a long way towards it. If we wanted to eliminate it altogether to the extent that it would be almost inappreciable, it would be necessary to cover all our lands, which are subject to erosion, with grass. The Texas experiment, as well as the Missouri, proved conclusively, that there is no better prevention to soil erosion than a good sod. At Spur, Texas, last year with the rainfall of about 16 inches, on a grass plat there was no erosion; with an annual rainfall of a little over 35 inches, in Missouri, over a period of 6 years, they annually lost soil at

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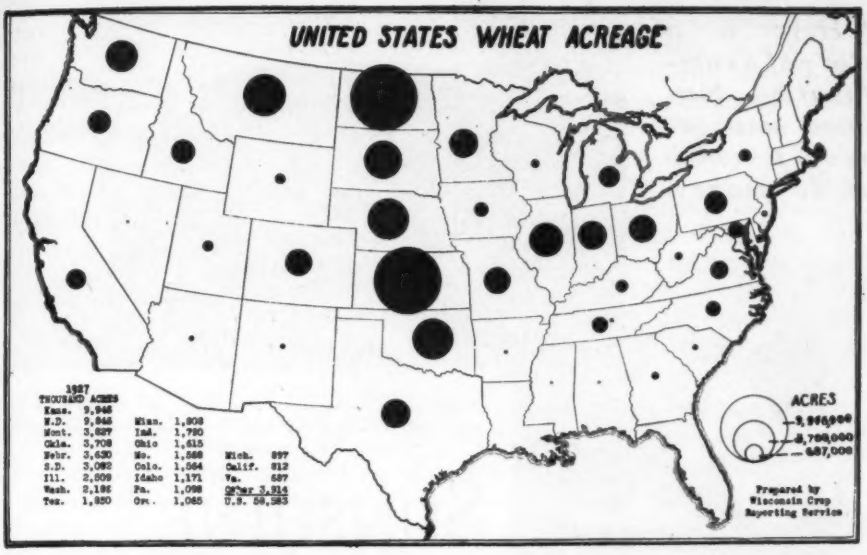

WHEAT

¶ *Fifth of our crop series*

By Walter H. Ebling

Agricultural Statistician, Wisconsin

OF all the cereal grains wheat is probably the best known and the most widely grown. No crop has played a greater part in the development of Western civilization than wheat. Its well known appellative "the staff of life" still bears witness to the important place it once held in the lives of men. It was perhaps the first grain to be domesticated and its influence on the progress of the human race dates well back into that period of dim unknowns—before the dawn of recorded history. When man carved his earliest records into the rocks, it had already become an item of importance. Its origin, while commonly attributed to the valleys of the Tigris and Euphrates in Asia, is not definitely known.

Wheat came to America from Europe with the earliest settlers. Gradually it moved westward with the advancing frontier. Always the leading grain crop, it has made the United States the world's leading wheat producer. American leadership in wheat was associated closely with the development of the grain binder which made possible the harvesting of huge acreages on the prairies of the West, and with the advent of modern threshing and milling machinery which were needed to dispose of the large production.

In most parts of the world the word bread

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¶ Here is a story of a combination plus good management which made money.

A harvesting scene where 750 crates per acre are being cut. Left: Putting the final O. K. on a crate of choice celery.

SUNSHINE SAND *and* CELERY

By J. L. Baskin

Atlanta, Georgia

WHEN Milwaukee is mentioned, we are reminded that "Schlitz made Milwaukee famous," but now that the days of Schlitz are over, Milwaukee must maintain her fame without its foam. Other cities are famous for the men they have furnished, statues they have erected, the roads they have built, the furniture they have manufactured, vineyards they have planted, or the crops they have produced.

Down in Florida there is a town of 10,000 inhabitants located on the beautiful St. Johns River that has become famous for the celery it produces. Sanford, county seat of Seminole county, produces one-third of the national supply of this golden harvest.

Along the banks of the St. Johns where once the savage Seminole fought and fished one can now hear the clutter of tractors making fields ready for celery and see giant motor trucks, loaded with crates of crisp, tender stems, speeding over paved roads to railroad terminals. During harvest the air is filled with the most delightful and appetizing fragrance which seems to keep all workers in a happy, snappy mood. Cutters, strippers, packers, craters, loaders, washers, and haulers, all seem to realize the obligation of delivering this most fragrant of vegetables to market in a way that it will please the consumer. Such organized cooperation explains why Sanford celery is demanded in increased quantities each year.

The soils of Seminole county, once the bed of the ocean, have almost perfect physical condition, but the thousands of years of tidal washing have made them almost devoid of plant food. The area devoted to celery is primarily of the Portsmouth series with a little Norfolk mixed in. After these soils were elevated, they remained as waste land for thousands of years and probably would yet be classed as such were it not for fertilizers and irrigation. Celery would never have been a success on these lands had the grower not early realized the value of an abundant and cheap water supply and furnished it. This water deficiency was adequately met by installing a complete sub-irrigation system of tiling to carry water from flowing artesian wells. Growers spend $600 per acre furnishing water to their crops, but this expense is well justified.

No sooner had the wells begun to flow through the underground passages before the growers realized that the soils were almost devoid of plant food. The problem of supplying ample plant food for a bountiful harvest was no small task. With ample water and sufficient plant food this vast wasteland has been turned into an intensively kept garden, many fields producing two carloads (1,500 crates) of choice celery per acre. Man has made a wonderful success by meeting nature's deficiencies of water and plant food. Furnishing water was primarily an engineering problem, but the supplying of plant food was chemical, nutritional, and biological. Here on these fields we find growers applying lime from Georgia, ashes from Canada, nitrogen from many countries, potash from Germany and France, and phosphate from Florida's own deposits.

First-hand Information

In order to learn what takes place on a celery farm, the writer interviewed Mr. J. E. Baker of Sanford who is an industrious farmer and a good celery grower.

"I commence my preparation early —beginning for the fall crop about September. After preparation I apply 1,000 pounds ashes and 500 pounds lime per acre broadcast. And, by the way, a celery grower can never produce maximum crops without good plants. I always try to not only have enough plants, but a surplus. I usually plant from October to December, depending on whether I want an

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J. E. Baker in a field of young celery holding a 4-inch tile, a network of which underlies his fields.

Potato Profits

By F. C. Deitz

State Institute of Applied Agriculture, Long Island, N. Y.

THERE are two sources of information relative to improving one's practice in growing a farm crop. One source is observation of the practice of the best growers, the other is experimental evidence.

Observing the practice of good growers often discloses excellent suggestions, but it is difficult to point to some one specific thing as the factor responsible for an increase or a decrease in yield because other factors which may have contributed just as much, or more, are not controlled. In a carefully conducted experiment the variability of these other factors is reduced to a minimum.

Practice as to the amount of potash for potatoes varies on Long Island. Many growers use ten per cent potash in their potato fertilizer, some use seven per cent, and others use only five per cent. Some years, and under some growing conditions, nearly the same yields are obtained. This instance serves to illustrate the influence of the variable factors. What per cent of potash could be recommended on the basis of the practice of other farmers, under conditions as cited above?

In 1926 the writer began a three-year experiment at Farmingdale, Long Island, to study the effect of potash on the yield of potatoes, and to study the residual effect of fertilizer on soil where continuous cropping with potatoes is practiced. On Long Island continuous cropping of potatoes is practiced by many growers; therefore the residual value, if any, is important. A survey of the fertilizer practice of the growers shows that there is a wide variation as to the amount of potash used, even on similar soils. Some growers are not using enough potash. For these growers, increasing the amount of potash in their fertilizer should result in increased yields of potatoes without materially increasing their cost of production.

The soil on which this experiment was conducted is a sassafras, gravelly loam, typical of much of the potato soil on Long Island. Previous to this experiment, general farm crops had been raised on this land; the rotation including hay, corn, and grain. None of these crops had received heavy applications of commercial fertilizer. The soil was tested for acidity, and found to be acid. Upon such soil, it was believed that potatoes should respond to the application of fertilizer.

The Fertilizer Treatment

In the spring of 1926, stable manure was applied to the experimental field at the rate of 10 tons per acre. The field was not manured in the spring of the two following seasons of the experiment. Plowing was done late in March, after which, the soil was thoroughly fitted. The experimental plots were then laid out and marked permanently with iron markers, so that the exact location of each plot could be easily determined the succeeding seasons. In 1926 there were nine plots, each 200 feet long and wide enough to plant ten rows of potatoes. The following diagram shows the arrangement of the plots:

1—Check	5—Check
2—5-10-0	6—5-10-0
3—5-10-5	7—5-10-5
4—5-10-10	8—5-10-10

9—Check

Since this work was directed to a study of potash and its effect on the yield of potatoes, potash was the only variable fertilizer in the experiment. Nitrogen and phosphorus were applied in equal amounts to all plots except the check plots. The amount of fertilizer applied to each plot was at the rate of 2,000 lbs. per acre and the foregoing table gives the analysis of the fertilizer used on each plot. In mixing the fertilizer for the plots, the nitrogen and phosphorus carriers were mixed first, using the following formula, on a ton basis:

100 lbs. Nitrate of soda
150 lbs. Ammonium sulfate
100 lbs. Dried blood
300 lbs. Tankage
1,160 lbs. 16 per cent Superphosphate

Where potash was used, is was obtained from high-grade sulfate of potash and muriate of potash; the amount varying from nothing to 200 lbs. and 400 lbs. in the 5-10-0, 5-10-5, and 5-10-10 fertilizers respectively. (The muriate plots were added to the experiment in 1927 with a 5-10-10 analysis.) Great care was taken to see that each plot received the same amount of nitrogen and phosphorus. The seed was planted about April 15 in 1926 and 1927 and about a week earlier in 1928. The seed used each year was certified Green Mountain from New York state.

Cultivation and spraying were done each year throughout the growing season in accordance with the best Long Island practice. The yields for 1926 and 1927 were normal yields for the location and the type of soil, but the 1928 yield was greatly reduced due to excessive rainfall in July, making adequate spraying impossible. This condition brought about a premature killing of the vines by blight. The reduced yield was the result of partially matured tubers. There was no late blight rot.

Considerable difference was observed during the growing seasons between the plots receiving fertilizer and the check plots. The plants in the check plots were less vigorous, had much smaller foliage, and were of a lighter green color. These differences were more pronounced each successive year of the test. In the summer of 1928 the vine growth in the check plots was very meager. The plots receiving potash made the most vigorous vine growth throughout the three years of the experiment.

Each year the potatoes were harvested during the latter part of September. After careful digging and an examination of the tubers for diseases, yields of the several plots were graded into a number grade and culls. In the table below, giving the yields of the various fertilizer treatments, the figures given for each treatment are the average for the two plots receiving the same fertilizer treatment.

POTASH PRODUCED MORE AND BETTER POTATOES

Fertilizer Treatment	Yield per acre in bushels					
	1926		1927		1928	
	No. 1	Culls	No. 1	Culls	No. 1	Culls
Checks	147	22	101	20	25	37
5-10-0 Fert.	152	40	108	22	68	45
5-10-5 "	191	30	253	23	115	39
5-10-10S* Fert.	258	14	264	18	120	36
5-10-10M† "	...	..	251	24	93	45

* Sulfate of potash.
† Muriate of potash.

Looking at the yields for 1926, it will be apparent that potash was a valuable factor in producing a better crop of potatoes. The increase in yields on marketable potatoes with the use of a 5-10-5 fertilizer as against the 5-10-0 was 39 bushels per acre. With 10 per cent potash in sulfate form, the yield of No. 1 potatoes was 67 bushels more than the 5-10-5 yield and 106 bushels more than the 5-10-0 yield. Even greater increases are found in the yields for 1927. In 1927 there is a reduction of 46 bushels in the yield of the check plots, and a reduction of 44 bushels in the yield of the plots receiving nitrogen and phosphorus, but no potash. In 1928 there are still further reductions in these plots. This indicates the danger of continuous cropping with potatoes where no fertilizer is used, or where one element as potash is omitted. The reduction in the 5-10-0 plots is undoubtedly due to potash hunger. The 1926 crop was able to get some potash from the soil of both the check and 5-10-0 plots, but the second and third crops suffered from a depleted potash supply. In the case of the no-fertilizer plots, the low yield is probably due to a deficiency of all three plant food elements.

The Next Year

Turning now to the 1927 yields of marketable potatoes on the plots receiving potash, we find an increase of 62 bushels per acre over the 1926 5-10-5 yield and a decrease for the 5-10-0 plot of 44 bushels in 1927. In the large increase of the yield of the second crop on the 5-10-5 plot, there is evidence of the residual effect of potash from the previous year's fertilizer application. The smaller increase in the 10 per cent potash yield the second year may indicate that the use of 10 per cent potash under a system of continuous cropping, is not economical on some soils. However, the 1926 yield with 10 per cent potash shows convincingly that this amount of potash is essential to a maximum yield on land which has not been heavily fertilized for previous crops.

The yield in 1928, although low on all plots, shows an increase of 5 bushels per acre for the 5-10-10S plot over the yield of the 5-10-5S plot. Due to the uncertainty of the factors involved in the low yield of 1928, this difference may not be significant, and should not be interpreted as indicating that under all conditions of continuous cropping with potatoes, a 5-10-10 fertilizer would pay after the first two years of cropping, better than a 5-10-5 fertilizer.

In 1927, a muriate of potash plot was added to the experiment in an analysis of 5-10-10. This was added for comparison with the 5-10-10S plot. For the season of 1927 there was a difference in yield of 13 bushels per acre in favor of the sulfate form. This difference was too small to be significant. In 1928 the yield of the 5-10-10M plot was 27 bushels less than the yield of the 5-10-10S plot. This may indicate that under some conditions sulfate of potash is a more desirable form to use than the muriate of potash. In a similar test made in 1927 at Hicksville, Long Island, there was a difference of 51 bushels per acre in favor of the muriate form. It is evident that what is best under one set of conditions is not necessarily the right thing under different soil conditions. The previous cropping and previous fertilizer applications, and the type of soil of a field must be considered. Then too, it is possible that the response of the plant to different forms of potash may be greatly altered by the kind of season, as to the average temperature during the early part of the season, the amount of rainfall, and the distribution of the rainfall.

It is unfortunate in some respects that the 1928 yield was reduced so far below the average for the two preceding seasons. Some of the spe-

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A round-up of cattle in the Battlement National Forest, Colorado.

Agriculture Today

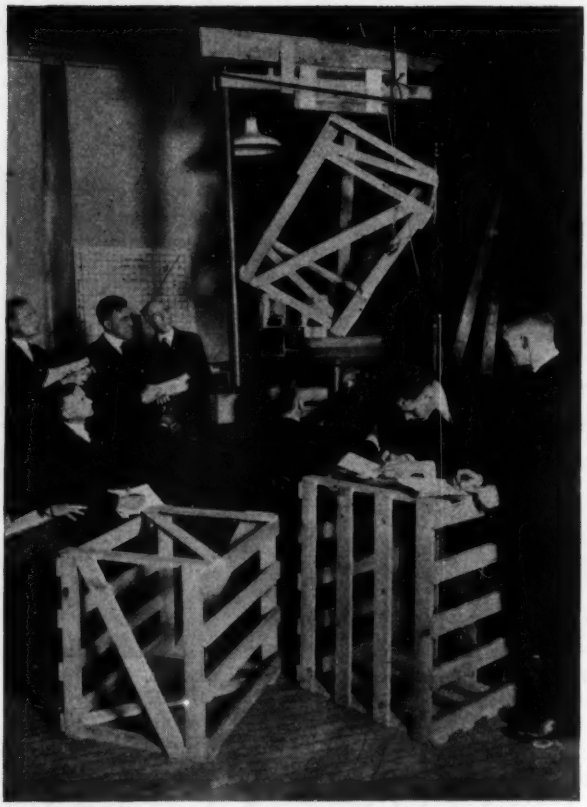
VI. Forestry

By Frank George

AMERICAN farmers own more than 140,000 acres of woodland. How to enable these owners to get the best return from this great aggregate of land, split up into scores of thousands of comparatively small parcels, is an important and complex problem. Added to this problem is that of promoting forestry practice on privately owned timberlands other than farm woodlands.

"The solution of the problem of farm woodlands may best be approached," according to R. Y. Stuart, chief of the United States Forest Service, "through better understanding of the part that a well-managed woodland can play in the whole farm enterprise. It involves guiding this action through advice and instruction based on organized research and adapted to meet a great diversity of conditions growing out of differences in area, location, character, and ownership of the woodlands."

In 1924 the enactment of the Clarke-McNary law provided means for broadening and intensifying ef-



Testing shipping crates at a Forest Products Laboratory which conducts wood utilization experiments.

forts by the Forest Service and State forestry organizations for extending farm woodland management. Under the provisions of that law 32 States have employed extension foresters through whom the States, the Federal Extension Service, and the Forest Service are now cooperating in bringing to the attention of farmers the possibilities for better agricultural practices afforded by woodlands, and through practical assistance in putting into operation the best known methods of handling woods.

The provisions of this Act call also for planting stock at low cost to farmers for the establishment of windbreaks, shelter belts, and farm woods. During the past year 4,509 farmers received assistance toward the management of 222,135 acres of woods; and more than 30,000 acres of farm lands were planted with approximately 28,000,000 young trees supplied by State forestry departments in cooperation with the Forest Service.

"Less progress," Mr. Stuart declares, "has been made in promoting forestry practice on privately owned timberlands other than farm woodlands. Thus far, the approach to a solution of this problem has been along two lines: one, the conduct of organized research into the principles and methods of timber management and wood utilization; the other, the making of the results of such research available to private owners and forest industries."

Investigations along these lines are being made at 11 Experiment Stations, the Forest Products Laboratory at Madison, Wisconsin, and by other units of the Forest Service and regional offices. A special investigation dealing with forest taxation is now under way under the direction of Professor Fred R. Fairchild of Yale University. The scope of Forest Service investigations thus includes organized effort toward the solution of problems in timber culture, wood utilization, forest economics, and in general of all questions involved in the management of forest land and the exploitation and use of its products.

"The McSweeney-McNary law, passed at the last session of Congress," Mr. Stuart says, "authorizes a much needed expansion of this work in forest research. Although great progress has been made in the past, even larger

problems lie ahead waiting to be solved, problems caused by the great diversity of forest conditions in this country, the many kinds of timber trees, the methods of utilization that have been practiced in the past, and the immense consumption of timber in the United States—more than all the rest of the world combined."

The Forest Service is promoting the adoption of forestry practice on privately-owned timberland also through cooperation with the States and private owners in fire protection. Under the provisions of the Weeks Law and the Clarke-McNary law, $3,890,000 has been expended by the Federal Government in the last 17 years in cooperation with the States in protecting timberland from fire. As a result of this activity on State and private lands, and of the work on the National Forests, about 292,000,000 acres of forest land in the United States are now under systematic fire protection.

Increased security to forest investments as a result of better fire protection, changing economic conditions, and greater familiarity with the timber-growing idea, are regarded to have helped in recent years to bring about some forestry practice on privately owned land. There remain, however, millions of acres of forest land that are waste or only partially forested, or covered by growth that is scrubby or of inferior species. This land, the forestry experts declare, should be growing full crops of timber if the needs of the nation are to be supplied.

The handling of the National Forests is regarded as being mainly an agricultural problem of huge proportions—the growing, protecting, and harvesting of timber and forage crops on 159,000,000 acres of land. Handling the timber resources involves pro-

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One of the meanest jobs in the world is fighting fire, but when a fire is discovered in the National Forests, it is fought until extinguished. Fire lines cleared of brush are usually used to check the spread of fires running along the ground.

In the Spring of 1927 when the flowers and shrubs were growing luxuriantly as a result of well-balanced plant food supplied by fertilizers.

Making *a* Home Out *of a* House

By Mattie R. Ferris

Jackson, Mississippi

NEVER before in the history of the South have our homemakers given so much thought to beautifying their premises. Millions of dollars are being spent annually for evergreens and smaller amounts for grasses with which to do this. Much of this money will be wasted, in fact, is being wasted because proper care is not taken to see that such grasses and shrubs are properly fertilized.

For several years I have been growing ornamentals for market, but have recently sold the nursery and moved away, so that no one need think I am trying to advertise my own wares. I had fine success in growing and marketing such ornamentals and attribute it entirely to having kept them well worked and fertilized. This applies not only to shrubs in the nursery rows but as well to the same after they had been placed in their permanent settings.

All who saw my small nursery were impressed with the beauty and symmetry of the plants and it was always possible to sell them in competition with other similar plants that were being held at lower prices. Such plants sell on their looks alone and unless healthy and symmetrical in appearance will never bring the cost of production. I was equally successful in developing in a very few years an attractive home at very small cost, starting with a house built in an abandoned cotton field.

In 1921, two years after the little home was built in an abandoned cotton field. The ornamentals and the lawn have a good start.

Knowing little in the beginning about the effects of fertilizers and nothing about the several plant food elements that give value to them, I applied to my nearest experiment station and was told that liberal applications of animal manures, supplemented with equally liberal amounts of commercial fertilizers, would likely be as helpful to crops of this kind as to the common farm crops of the country.

Only small amounts of manure were available and these were used on the plants permanently set in the yard, being supplemented by rather heavy applications of an 8-4-4 mixture. On the nursery proper no manure at all could be had and I depended entirely on a commercial mixture of the above composition purchased from a nearby fertilizer factory and used at the rate of 1,000 pounds or more per acre.

Some of these ornamentals were more or less subject to injury from low temperatures in winter and my experience went to show that this danger from cold might be materially lessened by the use of increased amounts of potash either in the mixtures or applied as a side-dressing. The idea of using potash to harden the wood as a protection against winter injury was obtained from the local Satsuma orange growers who had found that side-dressings of potash used in late summer rendered such trees much less subject to occasional winter freezes.

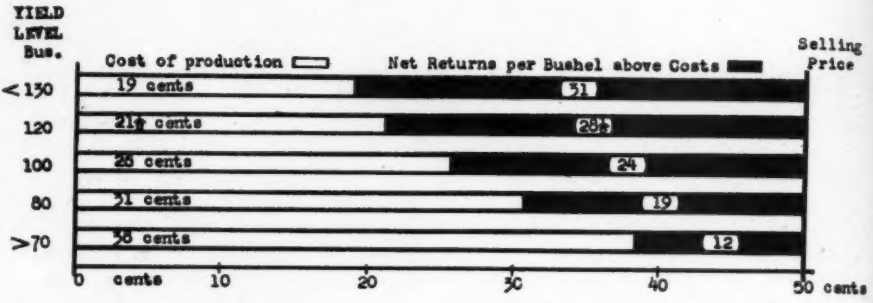
Ornamentals are used entirely to gratify a love for the beautiful and to satisfy one's aesthetic tastes. It would seem the height of folly to plant them for such a purpose and then allow them to become diseased and disfigured for the want of proper food. Like growing prize animals, those who produce prize plants must feed them liberally with well-balanced rations. Potash is said to control quality in plant growth more than any of the other plant foods and I felt one could scarcely afford to run the risk of this loss of quality by withholding this potash since it is the cheapest constituent of a fertilizer.

Several years later with the shrubbery severely pruned during winter. The home begins to take on a livable appearance.

Corn Production Costs

By H. L. Garrard

Mansfield, Ohio



THE MORE BUSHELS PER ACRE—THE MORE PROFIT PER BUSHEL.

WE sell our corn by the bushel so why not produce it on the basis of cost per bushel rather than cost per acre?

No single thing, but a combination of proper practices will enable farmers to produce maximum yields of corn per acre. These were the general conclusions from a summary of the practices of 510 farmers competing in the Ohio 100-bushel Corn Project over a period of nine years, as discussed by John A. Slipher, Soils and Crops Specialist of Ohio State University, at the recent Ohio Farmers' Week. Many of the farmers who completed the necessary records in the corn project did not succeed in producing the desired 100 bushels of corn per acre. Comparisons of the farming practices accompanying or resulting in certain yields or yield levels show some very interesting indications.

The higher the yield, the less was the average actual cost of production per bushel up to husking time. Therefore a greater profit resulted because of both more profit per bushel and more bushels per acre. The accompanying table shows that the average cost per bushel from yields below 70 bushels per acre was 38 cents,

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INCREASED YIELDS RESULTED IN LOWERING PRODUCTION COSTS AND INCREASING NET RETURNS.

Average Yields Bus.	Ave. Cost of production per bushel	Differences in cost of production per bushel	Net returns per acre above cost of production. (Corn @ 50c per bushel)
60 (Below 70)	38 cents	....	$ 7.20
80 (71-90)	31 "	— 7 cents	15.20
100 (91-110)	26 "	—12 "	24.00
120(111-130)	21½ "	—16½ "	34.20
140 (Above 130)	19 "	—19 "	43.40

Good Asparagus

By A. E. Wilkinson

Vegetable Specialist, Connecticut Agricultural College

DO you know your asparagus? Perhaps you do when it is before you on toast on a plate. But how about it out in the field, and how would you grow it to make money?

Ernest Lamb of Pawcatuck, Connecticut, could tell you how he is making money from asparagus raising. His field is not very large; he only has about five acres. The land is entirely level, of a heavy, sandy loam nature, free from stone, and is not more than 5 ft. above water table.

In starting the crop of asparagus, Mr. Lamb used a method which is becoming more common in Connecticut and in other eastern centers. This method was one originated by the writer and is called the Wilkinson Method. It consists in planting asparagus in rows 5 ft. apart with the plants in the row 9 or 10 in. apart. The plants are spaced in depth 9 in. from the average surface level, but they are not covered more than 1 to 1½ in. As cultivation progresses, the furrows are filled and the plants are not injured by being buried too deep. Asparagus is a plant hog. It needs lots of fertilizer.

Manure was available on the Lamb farm and as soon as the plants were placed in the trench and the inch of soil covered, then 1 to 1½ in. of well-rotted manure was spread in the furrow. This manure acted as a protection against loss of moisture, also prevented crusting of the soil and aided somewhat in plant food. As

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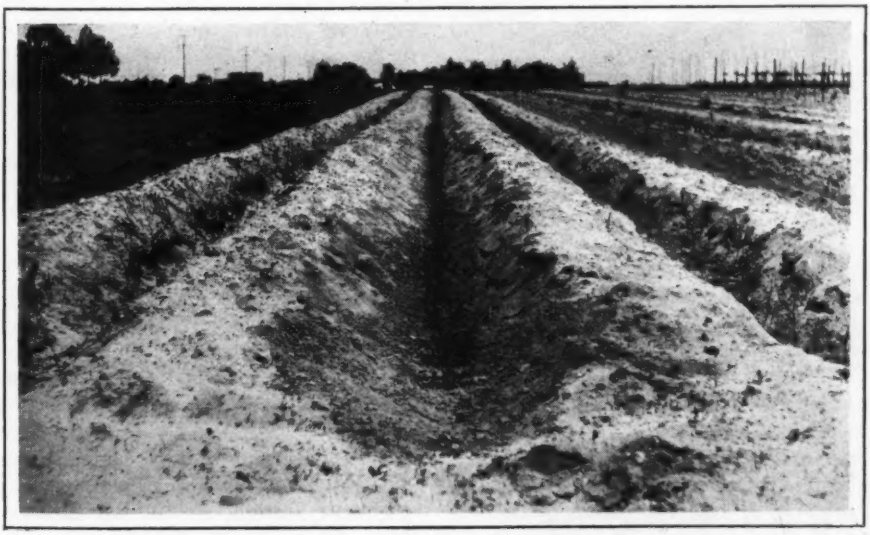


Starting the young asparagus bed—rows 5 ft. apart—plants 9 in. apart.

Improvement Winners

By J. D. Romaine

THE best soil improvement programs of county agents in the North and South as submitted in contests of the National Fertilizer Association are noticeably broad and uniform in their general outlines. This uniformity in the methods for soil improvement is the more remarkable when it is considered that the programs come from 12 states scattered over the humid regions of the United States. This would indicate that these county agents have selected very sound and fundamental practices or these would not pertain to such a variety of soils, climates, and cropping conditions.

In nearly all the programs, the soil improvement was begun by the use of lime to correct soil acidity. This was followed by the growing of leguminous hay and green manure crops, properly fertilized. With soil acidity and humus supply taken care of, conditions were favorable to the extensive use of properly balanced high analysis fertilizers.

In most of the programs also are included such features as legume inoculation, control of erosion, and improvement of pastures and hayfields by fertilizer top-dressings.

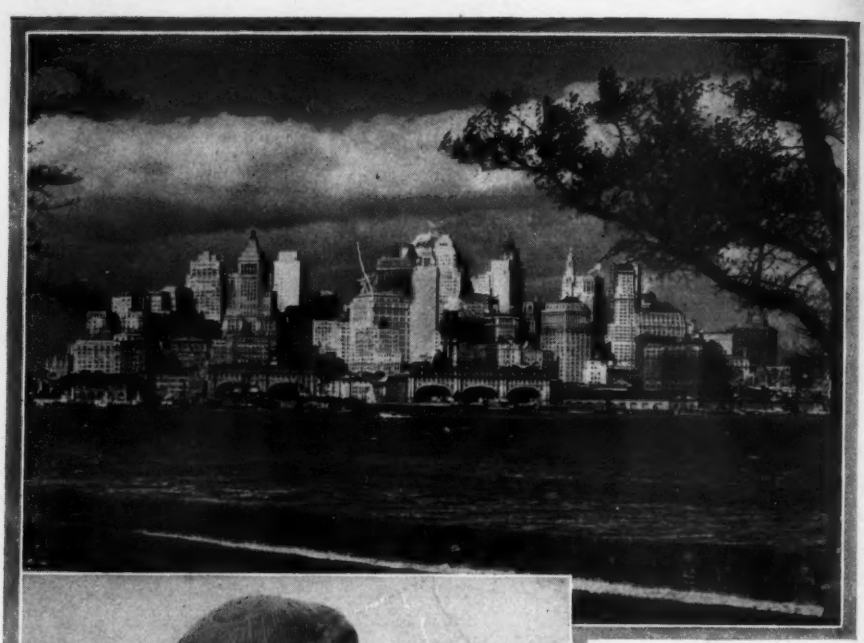
The methods used to put the programs in effect necessarily vary with local conditions, service demonstrations, clubs, agricultural trains, meetings, and especially soil acidity testing —all were pressed into service.

The good effects of these programs can be measured by the increased yields and quality of the crops, increased acreages of legumes grown, better systems of farming, increased tonnage of lime and properly balanced high analysis fertilizers, and in many sections, the more economical production of dairy products.

The agents who submitted the prize-winning programs are: O. E. Allen, Cass County, Mo.; T. H. Blow, Washington County, Vt.; W. G. Yeager, Rowan County, N. C.; C. D. Lewis, Hartford Co., Conn.; H. K. Sanders, Person Co., N. C.; C. L. McNeil, Madison County, Miss.; H. G. Sterm, Harrison County, W. Va.; R. Amundson, Outagamie County, Wis.; Earl W. Smith, Muskogee County, Okla.; G. R. Gilkey, Richland County, Ohio; H. C. Heath, Chambers County, Ala.; W. L. Hall, Faulkner County, Ark.; W. S. Barnhart, Muskingum County, Ohio; L. E. Thorn, Jasper County, Ind.

The competition for winning prizes was very keen this year and the judges had a difficult task to select the best programs. The judges represented an eminent group of agriculturists, and included for the North: G. I. Christie, Professor of the Ontario Agricultural College; A. J. McCall, Chief of Soil Investigations, U. S. Department of Agriculture; E. L. Worthen, Extension Soil Technologist, Cornell University; B. L. Hartwell, formerly Director of the Rhode Island Experiment Station; B. K. Bliss, Director of the Iowa Extension Service; and for the South: O. S. Fisher, Extension Agronomist, U. S. Department of Agriculture; W. B. Mercier, Director of Extension, Louisiana State University; I. O. Schaub, Dean of Agriculture and Director of Extension in North Carolina State College; T. S. Buie, Head of Department of Agronomy, Clemson College, S. C.; J. R. Ricks, Director of the Experiment Station, A. and M. College, Miss.

PICTORIAL



Above: The marvelous skyline of lower Manhattan, New York. The view was taken looking almost directly north from Governor's Island.

Left: The Spring harvest on the horse radish farm of D. C. Marshall, near Topeka, Kansas. The product goes to condiment factories.

Right: An inspiration to fisherman. A beautiful little falls in the White River, near Iron Bridge, Ontario.

Below: The chick seems to be quite contented with its foster mother, Miss Kathryn Landy, Hollywood film star.

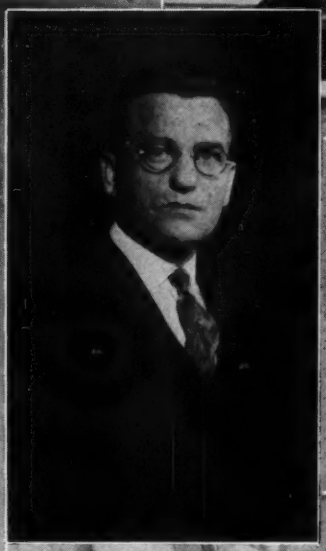
Left: This youngster is not worrying about the price of hogs for it has plenty of time to change before his pet pig grows up.

Right: Helping Mother, and at the same time finding an interest more absorbing than dolls.

Right: Harold Stoner, son of Mr. and Mrs. Paul D. Stoner of Ladoga, Indiana, has a good friend in this pet lamb, which he hopes will never have to be sold.

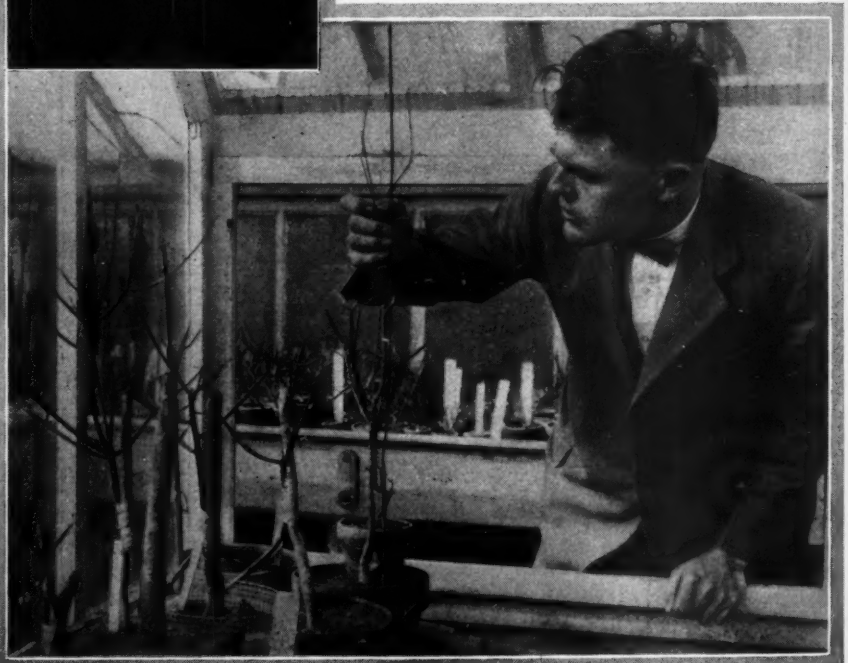
Left: Trying to understand each other. It looks as though an interpreter might be necessary for successful cooperation in this family.

Right: Miss Thyra Moore, daughter of Mr. and Mrs. F. W. Moore of Otterbein, Ind., watering two of her father's good horses.



Left: Dr. Clarence L. Holmes, who recently became chief of the Division of Farm Management and Costs of the Bureau of Agricultural Economics, United States Department of Agriculture. Dr. Holmes has been head of the Department of Agricultural Economics of Ohio State College at Ames.

Below: Dr. Charles F. Swingle of the United States Department of Agriculture who recently returned to Washington from Madagascar with live plants and seeds. Many of the plants brought along and some of those represented by seeds are rubber yielders that it is hoped in the years to come will help to keep our autos properly shod.



The Editors Talk

What Will the Harvest Be?

That is the question which every farmer, consciously or unconsciously, asks himself as he plans his spring seeding. In this day of surpluses, the thinking farmer should ask himself another question, "What is the other fellow's harvest going to be?"

There can be no definite answer given to these questions. No one can tell what the weather, the greatest of all factors affecting crop production, is going to be like during the several months of the growing season. There are other variable factors upon which no workable estimate can be placed. However, there is one, and a very important one, on which some fairly definite ideas can be obtained and from which the farmer can profitably govern his preparation for yields. This is the farmers' intentions to plant, a report of which has just been released by the United States Department of Agriculture.

The Department is to be highly commended for this report. Entailing a great amount of work on the part of the Crop Reporting Board in collecting information from 50,000 producers on the probable acreage of various crops, except cotton, to be planted in 1929, the report will enable farmers to make such adjustments in their plans for 1929 plantings as may seem desirable. Every farmer should receive and carefully study in line with his own operations the information contained in the assembled data.

There will be, according to the report, about a two per cent increase in the aggregate area planted, but farmers are planning some marked shifts between crops.

"If farmers carry out their present plans," says the Bureau of Agricultural Economics in interpreting the data, "there would seem to be a reasonably favorable market outlook for all hay and feed crops in the Western States, alfalfa for market, potatoes for market after the first of July, sweet potatoes, rice, flax, large-type peanuts, and most types of tobacco."

The Bureau cautions the farmers to reconsider intended acreages in beans, spring wheat, Burley and flue-cured tobacco, and cabbage in certain areas.

"Present numbers of livestock," it is pointed out, "indicate no material change in prospects for farmers growing hay and feed crops for sale, except in some Western and Northwestern areas, where severe winter has depleted reserves.

"Spring wheat farmers," according to the Bureau, "should watch for the April winter wheat report and be guided by it in determining whether to increase the acreage of hard spring wheat. Should the intended increase in acreage of hard red spring wheat of 8.8 per cent be carried out and average yields be obtained, a production of hard red spring wheat only slightly less than in 1928 would result. Such a production with an average winter wheat crop, would be large enough to produce an exportable surplus of the lower qualities of spring wheat.

"The combined acreage of the principal feed grains, corn, oats, barley, and

grain sorghums as now planned is unchanged from the acreage harvested last year and remains three per cent above that of 1927. Farmers indicate intentions to increase tame hay acreage approximately three per cent above that in 1928. Average yields on this acreage will result in sufficiently increased production to provide a surplus of market grade of hay in the North Central States as contrasted with the present shortage.

"Potato growers indicate they intend to plant 3,418,000 acres or 10.6 per cent less than that harvested last year. Allowing two per cent for usual loss of acreage from flood, drouth, blight, and other causes, this intended acreage would leave about 3,350,000 acres for harvest next fall compared with 3,825,000 acres harvested in 1928 and 3,476,000 acres in 1927. With average weather conditions, this acreage would produce somewhere around 390,000,000 bushels, a production which would furnish about the usual supply of potatoes after the heavy holdings from the 1928 crop are off the market."

For more detailed information, especially on intentions to plant in different regions, we heartily recommend securing a copy of this important report direct from the United States Department of Agriculture.

Common Sense

The primary object of all human effort, especially as related to industry, is gain. Whatever the units of measurement employed to determine gain, mathematics, the science of figures, plays an important role.

In this country, it is the dollar that we use as a unit for measuring gain. One hundred, the basis of the dollar, is also the basis of percentage. The relation between dollars gain to the farmer and percentage gain, is very close indeed.

Some of us have thought in terms of percentages, for instance as applied to fertilizer analyses, for so long that our entire viewpoint in feeding crops with relation to percentage of gain in dollars has been clouded.

Let us still think in terms of percentages, but never for one moment lose sight of the total pounds of plant food per acre, cost in dollars and cents, and profit. For example, as we approach the maximum use of phosphoric acid for a crop, the relative increases for each increment become smaller and our phosphoric acid curve flattens out. It is doubtful if we will ever be able accurately to determine for all conditions the percentage of phosphoric acid required. Especially is this true of small applications of fertilizer per acre.

Suppose we apply 400 pounds of 4-8-4 per acre to a crop and find indications of a deficiency of phosphoric acid. Why not apply a 4-12-4 fertilizer? If we believe that more than 8 per cent phosphoric acid is needed, it is sound economics to make it 12 per cent in actual farm practice. Phosphoric acid is cheap. The cost of the additional 4 per cent phosphoric acid in the mixture is less than 80 cents per acre. The 4-point increase in percentage of phosphoric acid may considerably increase the return in dollars.

What has been said of phosphoric acid applies also to potash. With small applications of fertilizer per acre, some crops show but a slight response when only 4 per cent potash is used. Increasing the potash from 4 to 12 per cent, however, may give outstanding results. Potash is cheap. Therefore, it is sound

economics to apply enough potash in your fertilizer to provide for maximum yields.

With increments of nitrogen one has to be more careful than with either phosphoric acid or potash, for nitrogen costs more. We must be sure of the need for extra nitrogen and of the possibility of large returns before it is a good economic practice to greatly increase the amount used.

On account of differential in costs of the three fertilizer elements, common sense dictates that in the feeding of any crop we safely may have a surplus of phosphoric acid and potash, but not a surplus of nitrogen. The fertilizer used should contain adequate quantities of all three elements, for we seek to supply soil deficiencies in feeding our crops. Only in this way are we assured of the largest return on our fertilizer investment.

Sulphur and Molasses

It is not so many years ago that Spring meant sulphur and molasses. Noses were held while great spoonfuls of the odious mixture were poked down the throats of protesting youngsters. Elders took the "spring tonic" to tone up sluggish systems after a winter of overeating and inactivity. Of course it worked; the recovery from a good dose of sulphur and molasses was enough to make any one feel better.

Modern health rules keep us toned up the year round. Some of these are quite simple and can be followed with litte inconvenience. Now along comes Miss Mary Leonard of the University of Illinois with ten commandments of health. "Eat less; chew more," she says. "Ride less; walk more. Clothe less; bathe more. Worry less; work more. Idle less; play more. Talk less; think more. Go less; sleep more. Waste less; give more. Scold less; laugh more. Preach less; practice more."

Practical and simple, aren't they? Let's be commanded.

The County Agent and Soil Improvement

Too often the county agent is taken as a matter of course without being given recognition for the great efforts he may be putting forth to help the farmers and other groups in his county. Called early and late from one end of the county to the other on matters pertaining to any of the subjects listed from A to Z in the encyclopedia, he is supposed to know something about all of them. Sometimes he finds a simple problem that with a little thought the farmer himself could have satisfactorily solved. Other times he saves the farmer large amounts of money by recommendations made or decisions ren-

dered. In either case, the county agent does his best striving to serve all fully and impartially.

One would think that all of this would keep a man occupied, and it would most men, but county agents are in a class by themselves. After answering the many enquiries and tending the multitude of details of his office, he goes out and makes himself more work by organizing meetings to discuss dairy herd improvement, marketing problems, poultry management, cropping systems, pasture improvement, fertilizer and lime usage, and a host of other projects. Then to fill out the rest of his time, he holds demonstrations on tree pruning, use of lime and fertilizers, legume inoculation, poultry culling, seed treatment, in fact demonstrable problems too numerous to mention.

These busy county agents have a very thorough knowledge of those branches of agriculture most pertaining to their counties. It seems almost inconceivable that a man having to cover such a wide field of knowledge could have much detailed information about any one subject. Yet we find many agents fully informed on fundamental facts connected with the most important problems in their counties. We have a good example of this in the soil improvement programs submitted by county agents to the National Fertilizer Association which are summarized elsewhere in this issue.

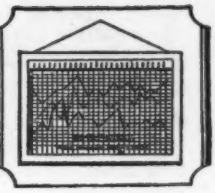
All of these men selected very basic practices as the starting points for increasing the fertility of the soils in their counties. These programs necessarily vary slightly to fit local conditions, but the underlying principles are the same in all of them. It is by no mere chance that these programs are so similar. The agents have carefully studied the fundamental factors in the conservation of the soil, the very foundation upon which all agriculture rests. Through their own experiences and that of countless others, they have learned that the correction of soil acidity, maintenance of organic matter, control of erosion, proper drainage, crop rotation, and the use of properly balanced fertilizers are of primary importance in soil management.

This is but one instance of the splendid work county agents are doing all over the country. They are attacking many other important problems in their counties, just as thoroughly and intelligently. It obviously is impossible for any one of them to handle all the phases of agriculture so completely. But we can rest assured that they are doing their best and are striving to accomplish more and more as time goes on.

Our appreciation and admiration go out to all county agents for the great services they are rendering, and our congratulations go to the authors of the winning soil improvement programs for the fine work they are doing.

HEARTY COOPERATION IN THE SPRING DRIVE FOR BETTER CROPS

AGRICULTURAL DEVELOPMENTS



By P. M. Farmer

PEA ROOT ROT REDUCED BY FERTILIZER

Liberal use of commercial fertilizer, applied carefully so as to prevent seed injury, is effective in reducing root rot of peas, according to results obtained by Dr. C. M. Haenseler of the New Jersey Agricultural Experiment Station, who calls it the best insurance for a good crop. Fertilizer doesn't prevent the disease, but it retards the spread of the fungus so that good yields can be obtained on heavily infested soils. On a field which was not used the year before on account of the prevalence of the rot, Dr. Haenseler last year demonstrated that by proper fertilization such fields can grow peas profitably. The best results were obtained when a superphosphate-potash fertilizer was placed in the row and the nitrogen, most injurious to seed, was given as a side application after the plants were up. The yield was 135.5 bushels of high-quality peas to the acre.

SEED TIME AND HARVEST

Wheat is ready to harvest at approximately the same date year after year regardless of the date of seeding, according to results obtained at the North Dakota Agricultural Experiment Station over a period of 36 years. In the years 1896, 1901, 1908, 1920, and 1924 the date of harvest was August 10, but the seeding dates those years were May 6, May 4, April 18, April 26, and April 22. In some instances there was a variation of a month from one extreme to the other in date of seeding yet harvest time came on the same date in both cases. However, late seeding is not recommended by the station as it usually results in the production of short straw and a light crop.

FIELD TESTS NEEDED TO TELL TRUTH ABOUT SOILS

Farmers will always have their own particular soil improvement problems, says Dr. L. H. Smith of the University of Illinois in summing up the results of the most recent crop rotation period on the 26 soil experiment fields of the State maintained by the agronomy department of the College of Agriculture. His summary showed that no single system of soil treatment proved best on all fields. The farmers' problems will be made easier, however, by the working out of fundamental principles on these State fields. "As a matter of fact," says Dr. Smith, "most soil fertility problems are so exceedingly complex that it is doubtful whether any simple laboratory tests will ever be devised that will take the place of the well-ordered soil experiment field. Aside from showing the way to improved farm practices, results from these fields bring out clearly some of the general principles in soil investigations. For example, the great variation in natural productiveness of Illinois soils is brought out strikingly by comparing the value of crops produced on untreated land. This value ranges from less than $4 an acre on one field to

nearly $40 an acre annually on another field. On one field the land is naturally so good that a yearly return of eight cents an acre is the highest profit from soil treatment. In contrast, on another field the best treatment gave a profit of more than $20 an acre a year. As might be expected, the poorer land in general produced more profit from soil treatment than the richer land."

CENTRIFUGE TO TEST SEED

The principle of the centrifuge has long been in use on the farm in the Babcock milk tester and in the cream separator. Now it is being used in North Dakota to test samples of seed wheat for farmers to determine if there are smut spores present. By this method only three minutes is required to make the determination. This year the county agents in Cass, Richland, Burleigh, Towner, Benson, and Ramsey counties are prepared to make this seed test for farmers in that State. It is the first time farmers anywhere have had such a service offered them to determine in advance whether or not it is necessary to treat seed for smut.

TELL YOUR TREATY MAKER

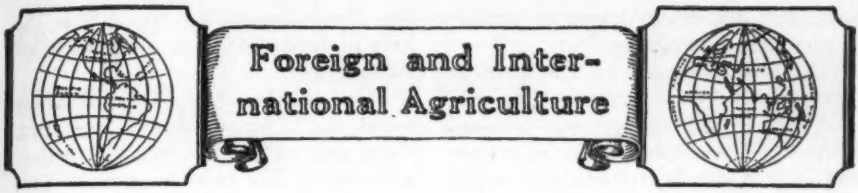
The International Agricultural Congress is to meet at Bucharest this coming June. Dr. Charles L. Stewart, in charge of agricultural economics at the University of Illinois, has a suggestion for this conference to sink its international teeth into. He says the farmers of the world need a new form of treaty under which the acreage devoted to crops that have international markets can be held down to prevent the production of ruinous surpluses.

PRICKLY PEAR STORES ITSELF

The Department of Agriculture has issued a bulletin in which the prickly pear is described as a silage crop that keeps without a silo. It grows in the four States bordering Mexico and has proved valuable as a stock feed in times of drouth on the range. These cactus plants are growing in favor with stockmen as a substitute for silage. In Texas some varieties of the prickly pear will produce without cultivation, but cultivation is likely to prove profitable. Because of the bulk of these cactus cuttings needed in starting the crop, and the consequent cost of starting a large acreage, it is desirable to start on a small scale and expand with the rapidly multiplying plants.

PROGRAM FOR WOOL PRODUCERS

A program for wool producers was outlined recently before the annual convention of the National Wool Growers' Association at Phoenix, Arizona, by J. F. Walker, specialist in wool marketing in the U. S. Department of Agriculture. He made four recommendations: 1. Establishment of wool classing and sheep breeding courses, to be taught from the wool-producing standpoint in agricultural colleges. 2. Carrying to the wool producer, through the Extension Service, a better knowledge of sheep classing and sorting. 3. Adaptation of the classing system, provided a sufficient quantity of wool is available, to be worked out through central stores rather than on the farm or range. ("There is no doubt that the classing of wool has not only increased competition for Australian wool but has enhanced its value as well.") 4. Improvement in methods of selling through cooperative associations. He added that "there is also the problem of cooperation among cooperatives; that there is no doubt that a combined central service organization can better serve producers and consumers of the United States by strengthening the bargaining power of the various cooperative organizations."



Hunting Grasses

By U. V. Wilcox

Washington, D. C.

GRASS is the basic food for all animal life. All flesh is grass, say the Scriptures. The continent of grass is Africa. For untold centuries the antelopes, the gnu, the cattle, and the savages have lived because of the strength and nutriment of the grass of the veldt.

"It seems logical to assume that since Africa supports such a wealth of animal life that the basic food, the grasses of Africa, must have unusual nutrient value. With this thought in mind the Federal Government sent there an expedition to collect the seeds of these unknown grasses so as to ascertain if they can be utilized in American agriculture." So said Pieters Kephart, plant scientist of the United States Department of Agriculture, who has just returned from a 10-months' trip through equatorial Africa gathering grass seeds.

Many bags of varied grass seeds were brought back to America. These will be planted, cultivated, and if possible adapted to conditions in this country.

"Africa is a continent of grass," Mr. Kephart explained. "There are practically no forests in Africa as we know the term. The tree growth there is useless for timber. There are no pines, oaks, spruce, or such trees. African timber is commercially valueless. The trees are gnarled, crooked, twisted and if cut will check, split, and crack. Most of the trees are small.

"The great vegetable growth is the grass. For thousands of miles the grass grows tall and luxuriant. Lions, tigers, and other beasts of prey hide in it. Antelope and cattle feed upon it. The natives use the grass for huts and for food and drink. African grass is essential to life."

Mr. Kephart explained that the grasses of this great continent are mostly unknown in America. It is hoped that they may prove useful in supporting grazing cattle in the western states. This will have to be proved and with the seeds now in America the experiment is under way and only time will ultimately tell.

"Beer" Grass

One of the closest relatives to African grass known to America is a type found in public parks. "Many of the baseball parks," Mr. Kephart declared, "use a type of African grass, hardy and long-lived. This is probably the only grass similar to the African variety known in this land.

"The odd thing about this type of grass is that the natives of Africa make a beer from it. The grass so used is in reality rotted and the beverage is horribly repulsive to a white man, tastes exceedingly bitter and

sour, but delivers a degree of intoxication that is amazing."

There is no desire on the part of government plant scientists to encourage such a use of our baseball grass and there is no danger of its being so used due to its taste, but to the scientific mind there is thus illustrated the unfortunate use that is made of a worthy vegetation.

Mr. Kephart and his associates had many thrilling experiences in their hunt for the strange and useful grass seeds of the African veldt. Lions roared; torrential rains impeded their progress. Traveling along the equator the extremes of heat and cold were experienced. In one instance the nights would be dangerously cold and the days oppressively hot. At one place there was found within 35 miles a skating pond with glaciers when a few hours' descent would bring all the oppressiveness of debilitating heat. This was the case in a region located on the equator.

Hunting grasses meant long treks across plains devoid of roads and trails. An American motor truck plus the help of husky African natives carried the baggage.

"One of the chief problems which faced us," Mr. Kephart explained, "was that of water. We had to boil all water. The trips frequently made were from water-hole to water-hole. No matter how thirsty we were, we had to wait until the water was boiled. This water was frequently taken from great mud holes, or sinks. Here the game from miles about would wallow at night hiding about in the long grass and quenching their thirst. Human beings from other lands could hardly endure the germs thus supplied to the water in such liberal quantities, consequently the need of boiling.

"The African, could, however, brush all the scum, the insects, and the visible dirt aside and drink with apparent immunity. Centuries of the survival of the fittest have given their bodies a resistance but the white man had to guard against malaria and the germs that produced dysentery."

(*Turn to page* 47)

In darkest Africa, where a search was made for grasses which might be adapted to American agriculture.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Soils, Fertilizers, Economics, Crops, Crop Diseases, and Insects. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

Much practicable information on the purchasing and use of fertilizers is contained in Professor A. T. Wiancko's circular "Fertilizers for Indiana Soils and Crops," Agr. Exp. Sta., Lafayette, Ind., Cir. 162, Oct. 1928. Fertilizer recommendations for various crops on different soils under several systems of farming are given in a table, and some erroneous ideas concerning fertilizer materials are explained. All this is carefully presented in condensed form well repaying the reader for the few minutes needed to digest this publication.

"State Laboratory Fertilizer Report—Seed Report," Quar. Bul., Vol. 18, No. 4, State Board of Agriculture, Dover, Del.

"Inspection of Commercial Fertilizers" Agr. Exp. Sta., Amherst, Mass., Control Ser., Bul. 45, Dec., 1928, H. D. Haskins, H. R. DeRose, and M. W. Goodwin.

"Nitrate of Soda Experiments—1928," Agr. Exp. Sta., Clemson College, S. C., Cir. 36, Feb., 1929, W. B. Rogers.

Soils

"Drainage in the Sacramento Valley Rice Fields," Agr. Exp. Sta., Berkeley, Cal., Bul. 464, Jan., 1929, Walter W. Weir.

Crops

The authors of a new bulletin on "Approved Practices for Sweet Potato Growers," Bul. 263, of the North Carolina Agricultural Experiment Station, briefly attack the reasons why the quality of sweet potatoes is not what it should be. H. B. Mann, R. F. Poole, and Robert Schmidt, the authors, attribute poor quality to: 1, unsuitable soil types; 2, fertilizers containing excessive nitrates and insufficient amounts of potash; 3, varieties and strains not best suited for all conditions; and 4, diseases. The recommendations are tabulated in such form as to make this valuable 8-page bulletin an exceedingly ready reference for the problems of the sweet potato grower.

"Thinning Sugar Beets," Agr. Ext. Service, Berkeley, Cal., Cir. 22, Dec., 1928, W. W. Robbins.

"Strawberry Culture in California," Agr. Ext. Service, Berkeley, Cal., Cir. 23, Dec., 1928, A. H. Hendrickson.

"Bush Fruit Culture in California," Agr. Ext. Service, Berkeley, Cal., Cir. 25, Jan., 1929, A. H. Hendrickson.

"Monthly Bulletin of the Department of Agriculture," Sacramento, Cal., Vol. XVIII, No. 1, Jan., 1929.

"The Climate of Florida," Agr. Exp. Sta., Gainesville, Fla., Bul. 200, Nov., 1928, A. J. Mitchell and M. R. Ensign.

"Variety Tests of White Potatoes," Agr. Exp. Sta., Gainesville, Fla., Bul. 201, Nov., 1928, L. O. Gratz.

"Peach Pruning in Maryland," Agr. Exp. Sta., College Park, Md., Bul. 299, July, 1928, A. L. Schrader and E. C. Auchter.

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., Vol. XI, No. 3, Feb., 1929.

"American Potato Journal," The Potato Association of America, East Lansing, Mich., Vol. VI, No. 2, Feb., 1929.

"Building Permanent Pastures," Agr. Ext. Service, Raleigh, N. C., Ext. Folder 28, Jan., 1929, S. J. Kirby.

"The Normal Multiple Sprouting of Seed Potatoes," Agr. Exp. Sta., Wooster, O., Bul. 430, Jan., 1929, John Bushnell.

"Director's Biennial Report—1926/28," Agr. Exp. Sta., Corvallis, Ore., Sept., 1928.

"Cotton Variety Tests—1928," Agr. Exp. Sta., Clemson College, S. C., Cir. 35, Feb., 1929, T. S. Buie.

"The Utah Agricultural Experiment Station," Logan, Utah, Cir. 76, Feb., 1929, P. V. Cardon.

"Biennial Report of Director, July 1, 1926-June 30, 1928," Agr. Exp. Sta., Logan, Utah, Bul. 209, Feb., 1929.

"White Biennial Sweet Clover as a Cover Crop," Ext. Service, State College of Washington, Pullman, Wash., No. 151, Feb., 1929, A. E. Lovett.

"Reliable Relief for Agriculture," Col. of Agr., Madison, Wis., Cir. 226, Feb., 1929, H. L. Russell and K. L. Hatch.

Economics

The California College of Agriculture's new circular 24, "Enterprise Efficiency Studies on California Farms," by L. W. Fluharty and F. R. Wilcox, gives a summary of cost account records. Since 1925, farmers of California have been keeping efficiency and cost records on various farm enterprises in cooperation with the Agricultural Extension Service of the University of California. Records have been kept for citrus fruits, nut crops, field crops, dairying, and poultry raising. The summary contained in this circular is a valuable insight to production costs.

Bulletin 462 of the California College of Agriculture, by S. W. Shear, is a comprehensive treatise of the prune supply and price situation. California produces approximately two-thirds of the commercial prune crop. The world production of dried prunes during recent years has been about 70 per cent larger than during the period 1909-1913. As a result of the increasing production, the California prune industry is faced with the probability that on the average prune prices will be unprofitably low, unless improvements, notably in lowering market costs and increasing demand for prunes, are made.

"The 1929 Agricultural Outlook for California," Agr. Ext. Serv., Berkeley, Cal., Cir. 27, Feb., 1929, H. R. Wellman.

"A Survey of the 1928 North Dakota Wheat Crop," Agr. Exp. Sta., Fargo, N. D., Bul. 222, Nov., 1928, C. E. Mangels, T. E. Stoa, and R. C. Dynes.

"Illinois Crop and Livestock Reporter," Bureau of Agricultural Economics, U. S. D. A., Washington, D. C., and Illinois Dept. of Agr., Cir. 386, Feb. 1, 1929.

Diseases

"Coconut Bud Rot in Florida," Agr. Exp. Sta., Gainesville, Fla., Bul. 199, Sept., 1928, James L. Seal.

"The Damp-Off Disease of Boston Ferns," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 410, Mch., 1929, Erdman West.

"Ammoniacal Copper Carbonate and Other Stainless Fungicides," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 411, Mch., 1929, Erdman West.

"Bordeaux Paste Treatment for Stem-end Decay of Watermelons," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 412, Mch., 1929, George F. Weber.

Insects

"The Southern Corn Rootworm," Agr. Exp. Sta., Fayetteville, Ark., Bul. 232, Jan., 1929, Dwight Isely.

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TRUOG TELLS HOW TO FERTILIZE CORN

Four principles on corn fertilization developed in recent years were emphasized recently by Professor Emil Truog of the University of Wisconsin before the Agricultural Conference at Purdue University. No. 1—The smaller the rate of fertilizer application, the more localized or nearer to the seed or plant should the application be. No. 2—The nearer fertilizer can be placed to the seed without

causing serious injury to germination, the more effective the fertilizer will be in promoting early growth and, usually, final yield. No. 3—Broadcast applications of phosphate and potash should be worked into the soil to a depth of at least four inches. No. 4—Heavy additions of readily available nitrogen should not be made in one application.

BACKING UP THE PRINCIPLES

Professor Truog backs up the first principle by saying that the soil has a certain fixing power for phosphate and potash, and that the more soil these fertilizers are mixed with the tighter they are held by the soil and the more difficult it is for the plants to get them out. Another reason for placing the fertilizer close is that phosphates move very slowly in the soil and potash is not much faster, therefore the plant food must be in the region of early root development. The fertilizer needs to be close to the roots also because the corn will grow rapidly from the start and it will be possible to cultivate to advantage at an early date giving the corn a good lead over weeds. But if too much fertilizer is placed in contact with the seed it can not germinate for the fertilizer keeps the seed from absorbing moisture. When making hill applications, says Truog, apply the fertilizer directly over and about one-half inch above the seed in a band about four inches wide and eight inches long. In row applications the difference is there is a continuous flow of fertilizer. Row application is best when corn is drilled, and hill application when it is check-rowed. It is recommended that broadcast applications of phosphate and potash be worked to a depth of four inches because appreciable amounts of phosphate do not move down more than half an inch during the growing season, and potash moves on a little faster. Nitrogen fertilizers, on the other hand, soon go over into forms that move about too rapidly, which accounts for applying this plant food in driblets.

DO IT THIS WAY

The ideal method, laid out by the Wisconsin professor: When a heavy application of complete fertilizer is to be made to corn, apply broadcast most of the phosphate and potash after plowing and work to a depth of at least four inches by discing; at time of planting add a complete fertilizer in hill or row; and during cultivation apply nitrogen as needed. When corn is grown in rotation with small grain and clover, make a broadcast application of phosphate and potash when the soil is prepared for the grain seeding. If a heavy application is made at this time, it may not be necessary to repeat it for corn, but it may be desirable to make the hill or row application.

Hunting Grasses

(*From page* 44)

Of the dangers incident to such a scientific expedition, Mr. Kephart would say but little. Terrible heat, drenching rains amounting to cloudbursts, and wild animals were but incidents. From out of the long grass a great rhinoceros would charge. With lowered head and horn pointing forward, the three-ton battering ram would lumber forward.

"The thing to do under the circumstances," Mr. Kephart explained, "was to stand still while the stupid beast came charging and then sidestep the last minute and let the great hulk spend its fury running for a half mile or so. This is the only way to safely outwit the rhino since it has but very

poor eyesight yet very acute hearing. Of course if there is no place to step out of the way, well, you are just out of luck, that's all."

Scaling the approaches of the Mt. Kenya region hunting for grasses where progress had to be made painfully and slowly, fighting for each step in the tall tangled growth of vegetation of equatorial Africa, there suddenly appeared a few yards just ahead of the party a huge elephant. Bamboos were on every side at that point, but the elephant tore them down as if they were but wheat stalks, the meanwhile curiously advancing on the scientists.

It was impossible to retreat rapidly, the progress had been made too slowly. To turn and run would not bring escape since the elephant was all-powerful. Had it been possible, these scientists would hardly choose to relinquish the territory gained for a mere elephant.

With the elephant coming, the men stood their ground and waited. The great beast eyed them curiously and continued toward them, a great mountain of flesh, bone, and muscle. When within a few feet and with the scientists' lives and equipment in the balance, the great beast stopped, swung his trunk about disgustedly, and with the skill of a trained private of the army turned and disappeared in the grass and bamboo. Having bluffed out elephants, rhinos, lions, tigers, and other animals the party stuck to its job of gathering grass seeds.

Such venturesome explorers of the office of Foreign Seed and Plant Introduction of the Bureau of Plant Industry of the United States Department of Agriculture scour the world. The value of hundreds of crops that have been introduced or improved upon has been estimated conservatively at $100,000,000 annually. Included in the list are the hardy wheat called durum; Peruvian alfalfa, now the most important variety in California; Pima cotton, the great crop of the Salt River Valley of Arizona; the date palm, now grown as an established industry in the Southwest; Sudan grass an important forage crop in many States; and others too numerous to mention.

Dr. David Fairchild, chief of the Foreign Seed and Plant Introduction Office, states that there are easily 10 times as many undiscovered plants in the tropics as are to be found in the colder parts of the globe. This explains why the plant hunter concentrates his attention on the world's sunniest regions. By means of his highly technical art, he is striving to select the hardiest growths of the lot and adapt them for cultivation as far North as they will grow.

What happens to the many hundreds of test plants and the bags of seeds? First of all, the plants and seeds must pass a rigorous customs inspection to determine their freedom from disease and insect pests. Thereafter as an additional safeguard, they are grown for a time in detention.

The next process is to spread them among Government research workers in Washington as well as among the State plant experiment stations. Here efforts are made to determine their adaptability as breeding agencies. In case new growths are found useful, the final step is to distribute them among the thousands of plant breeders, farmers, and amateurs throughout the land.

These plant immigrants are very much like human immigrants in certain respects. Most of them require a long period of acclimatization and a good many have to be bred with our domestic varieties before their real worth is known. Like all living things, the cultivated plants on which we subsist are changing continually through Nature's unconscious but nevertheless definite process of selection, while plant breeder's lore brings quicker and sometimes equally widespread variations.

Rhode Island

(*From page 9*)

by the use of non-alkaline material in combination with sulphate of ammonia. This makes the soil more acid; furthermore, by using only a small proportion of phosphoric acid, the activity of the alumina is not depressed and its toxic effect on weeds is retained. Putting greens have been surveyed and the weedless-lawn principle demonstrated successfully on them.

The poultry investigations have followed three general lines of endeavor. The most important of these has been concerned with diseases of chickens and turkeys. Contributions to a knowledge of the organisms involved and in some cases means of control have been made with fowl paralysis, bacillary white diarrhea, blackhead in turkeys, and bacterial infection of eggs. The rotation method of control of blackhead in turkeys has been demonstrated to be of use in controlling the disease.

In connection with poultry management the Rhode Island station has studied the efficiency of protein concentrates for promotion of the rapid growth of winter chicks and the availability of nitrogen in cottonseed meal and beef scrap for chicks.

Inheritance problems have furnished a fertile field for research. The inheritance of body-weight has been studied in connection with the Cornish-Hamburg cross and the Leghorn-Brahma cross. The inheritance of egg-weight has also been a major problem of the station.

Since 1925, three new lines of work have been initiated and already progress has been made.

Studies with small fruit are in progress. The varietal adaptation of grapes, raspberries, blackberries and blueberries to coastal conditions and the inheritance of undesirable characteristics in blackberries are being studied.

In home economics the use of time by rural homemakers, the frequency of paid work by homemakers and the culinary qualities of potatoes as affected by fertilization are in the course of investigation.

Studies concerned with marketing conditions in Rhode Island, and in particular in the Providence area, have been made since 1925. In this connection methods of handling fresh produce, wholesale market preferences for fruits and vegetables, economic phases of the fruit industry, and sources of carload receipts of food in Providence have been described in station publications. A statistical description of Rhode Island agriculture has also been published. Investigations along similar lines are being conducted with poultry and dairy products. Farm management studies are also being made.

Good Asparagus

(*From page 29*)

soon as the plants come above ground, a heavy application of fertilizer was given. At first a 5-8-7 type was used at the rate of one ton per acre, and before the season was over two applications of nitrate of soda and muriate of potash were applied as an additional dressing, 200 lbs. of each of these materials in each application. Asparagus is a plant food loving plant,

particularly a potash loving plant, therefore, enough was given to feed its needs.

Mr. Lamb felt that some of his land was not just right for the best asparagus raising, and he applied one ton of hydrated lime to practically all the land in order to bring it in condition where asparagus would grow best. Every third or fourth year another application of lime is given, thus maintaining the desired condition. At the end of the first year his asparagus had made a growth of top as large as many growers obtain in three years.

Part of this, and a large part, is due to the abundance of plant food, but also a large share must be given to Mr. Lamb's working of his bed. In the six or eight years that I have known Mr. Lamb, I have never seen a fully developed weed on his farm. Where most people realize that weeds are fertilizer robbers, moisture robbers, sunlight robbers, and destroyers of prolific plant growth, I wonder how many realize this as much as Mr. Lamb.

This new method of asparagus raising calls for cutting the asparagus after one year's growth. Mr. Lamb cut the bed only two weeks and his bed was strong enough to cut three or three and a half weeks. He took an average of $45 per acre after one year's growth. The second year he cut the bed five weeks and secured $150 per acre. The third year he cut the bed until the middle of June and received $350 per acre.

On other systems of raising asparagus, the third year is the first year when the asparagus is cut and generally speaking $50 to $60 per acre is about all that is received. This newer method with its intensive planting in the row, but still allowing sufficient space for each plant, and plenty of plant food, have certainly paid Mr. Lamb.

In marketing the grass he is very painstaking. He is ably assisted by Mrs. Lamb in this work and they are very careful to see that the bunches that are sold are very much worth while, not only as to size of stalk in the bunch, the length, the color, but the quality. To say that he has an increasing demand for the crop is only half stating it as buyers pester him to death coming to his farm to buy. He has men who would like to take the entire crop and, therefore, solve all of his marketing problems. In fact, for the last several years the bulk of his crop has gone to one marketing agency with great satisfaction to both parties. This has permitted Mr. Lamb to give more time and attention to the growing end of asparagus raising.

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24 Tons of Tomatoes

(*From page* 6)

This ripening difference continued right through the harvest season. The plot which ripened first was the first one to reach the end of its normal bearing season. When the frost came that fall there were tons of green fruits still on the vines, but very few fruits could be found on the high potash plots. That part of the field not in the demonstration was fertilized with a 2-12-6 at the rate of 500 pounds per acre. The bulk of the green fruits were found on this part of the field.

So in the canning factory tomato game the grower can often get the bulk of the crop before frost kills the vines by the use of potash under conditions like those on the Harper place. The black loams and black sands and mucks might be equally benefitted by

(*Turn to page* 55)

Pages From A Field Note Book

Fewer Acres—More Cotton

By Lynn L. Smith

County Agent, Hope, Arkansas

FEWER acres of cotton—but more cotton per acre, agriculturists agree is the big need in the South. The difficulty comes in persuading the average cotton farmer that he will earn a bigger profit by using every known method to increase the yield per acre instead of scattering his efforts over more acres. While many factors enter into the problem of making two bolls of cotton grow where only one grew before, in this article we shall confine ourselves to a discussion of a more intelligent use of commercial fertilizers.

The desire to plant cotton strikes the cotton farmer like a fever epidemic, with the result that he plants more cotton than he can adequately cultivate. Not only does the increased acreage keep him from planting and cultivating essential feed crops, but in addition, it causes him to scatter his limited amount of commercial fertilizer over too big an area. The result is a smaller yield of cotton on the increased acreage with a greater expenditure of labor and money producing it.

Evidence is accumulating which unquestionably shows the value of liberal applications of high analysis fer-

The plant in the right hand had 20 bolls and was from an acre fertilized with 600 lbs. of an 8-6-8 and which yielded 972 lbs. The plant in the left hand had only 5 bolls, was unfertilized, and the yield per acre was only 365 lbs.

Plot	Fertilizer per acre		Yield		Returns
1	Check Plot	No Fertilizer	325 lbs.	Seed	$22.75
2	225 lbs.	10-4-4	240 lbs.	" (Av. 34 A.)	16.80
3	600 lbs.	8-6-4	912 lbs.	"	63.84
4	600 lbs.	8-6-0	831 lbs.	"	58.17
5	600 lbs.	8-6-8	972 lbs.	"	68.04

tilizer. In 1928, the season just closed, a demonstration conducted on the farm of J. G. Collier near Hope, Arkansas, by J. E. Jones, supports the above conclusion. The fertilizer applied, the weight of the crop per acre, and the actual cash received, are shown in the table above. Numbers 1, 3, 4, 5 were one-third acres; 2 the average for 34 acres.

It is obvious that a heavier application than 225 lbs. per acre would have been far more profitable. It is also evident that on the Orangeberg fine Sandy Loam more potash gave an increase both in yield and gross profit.

If Mr. Jones had used the 8,000 lbs. of 10-4-4 fertilizer on 12 or 15 acres, he would have made far more profit and in addition could have raised on the remaining 20 acres enough legume roughage to feed 10 dairy cows through the winter. It is more profitable to grow 5 bales of cotton on 10 acres than to grow 10 bales on fifty acres.

POTASH ON FRENCH SOILS

RESULTS of numerous trials of potash fertilizers conducted since 1926 by the French Office of Agriculture have been reported by the French Director of Agriculture. Considering the results as a whole, they show very favorable and profitable returns from the judicious use of potash fertilizers, although definite conclusions are not yet drawn. These tests have proven the necessity for potash on all crops, and if not on all soils, at least on the very great majority of them. On some soils all crops responded favorably, while on other soils, some crops responded to potash, while others did not.

Studying the rate of application on these French soils, 500 lbs. per acre of muriate of potash were found to be more profitable than 250 lbs. On heavy soils, 500 lbs. of muriate appeared to give the best results. On light soils subject to drought, kainit at 1,200 lbs. per acre was found to be superior to muriate at 500 lbs. Early applications of the potash salts gave better results than later applications. The efficiency of potash decreased with the later applications, being of no value to the crop if applied too late in the season.

All the tests showed the importance of having the soil well supplied with lime if the best results are to be secured from the potash. The lime should be applied well ahead of the potash application (sometimes a year), rather than along with the potash. Le Phosphate et Les Engrais Chimiques, Paris, Nov. 1, 1928.

FRENCH PASTURES

RECENTLY a farmer in France had a pasture of more than 25 acres which at the beginning of spring was completely grown over with mosses. At the middle of February this farmer broadcast 937 pounds per acre of potash manure salts on a dewy morning. Two days after the mosses were completely dried up and upon inspection in the month of March, the large yellow spots corresponding to the burnt moss areas were very noticeable.—M. Fleury, Agronomist, La Potasse, Nov. 1928.

Plowing by Electricity

ANOTHER use has been found for electricity on the farm. This time it plays the role of a lubricant. It is not a case of the proverbial "greased lightning," however. Rather, "lightning" does the "greasing." Briefly, a process has been devised whereby an electric current reduces the friction in plowing.

The apparatus was invented by Dr. B. A. Keen, an authority on the development of the plow, and Dr. W. B. Haines, at the Rothamsted Experimental Station in England. Dr. Keen described the process at the International Soil Science Congress, held at Washington two years ago, and exhibited an apparatus for recording the resistance of the soil to the plow.

The process is based upon the following elementary facts: slightly moist soil conducts electricity; when a current passes through the soil between two pieces of metal, acting as poles, additional moisture is deposited on the negative pole and the plow passes more readily through a moist soil.

A small electric generator is attached to an ordinary plow. A metallic electrode in the form of a cutting coulter, rigidly suspended a short distance in front of the plowshare, acts as the positive pole. The steel plowshare is made the negative pole, and an electric circuit between the two deposits a film of moisture upon the share. This acts as a lubricant to reduce the friction between the blade of the plowshare and the soil and makes the soil slide over the moldboard more easily.

Such a process is simple, and the generator does not greatly increase the weight of the plow.

Dr. Keen reports that the old English system of mole drainage for compact and poorly drained subsoils may also be facilitated in this way. The shell-shaped borer which pushes the soil away from a circular drainage way 18 to 30 inches below the surface of the soil is made the negative pole and accumulates the friction-reducing moisture. This method of making an underground drain is much cheaper than tile drainage, and the circular drainage ways are said to remain open in the earth for 10 to 12 years.—*Carl R. Woodward, New Jersey College of Agriculture.*

Sunshine, Sand, and Celery

(*From page* 19)

early or a late crop. I grow the Golden Bloom variety which is a vigorous, heavy yielder and makes good quality.

"A celery grower can produce 750 crates of celery per acre almost every year provided he applies enough fertilizer and keeps his spraying up. On my crop I have been using a brand known as Celery Special, analyzing 5-6-10, at the rate of 6,000 pounds (3 tons) per acre. A part of this fertilizer is applied every two weeks because with sub-irrigation leaching is taking place all the time. But in a broad sense, leaching is plant food in solution, which is a necessary condition to the production of high yields.

"In addition to my regular fertilizer I apply 200 pounds of muriate of potash per acre in two side applications. This year I have four acres with 400 pounds muriate per acre and it is the best celery I have. We growers don't use enough potash to secure either the largest yields or best quality. Celery, you know, is a heavy feeder on potash and its quality is

greatly influenced by liberal applications of this material. Potash keeps my celery glistening, green, and smooth, producing crisp, tender bunches that bleach readily.

"Of course it would be foolish to spend money to grow a crop of celery and not protect it against blight and insects. I spray my celery often, and when the weather is hot, I keep a sharp lookout for outbreaks of blight. I use 4-4-50 Bordeaux into which I pour three quarts of concentrated lime sulphur.

"Last year was a most trying year for the celery growers on account of low prices. However, in spite of the low prices I sold my celery readily at a profit because of its extra quality. Since I have been using potash liberally, I have practically no blackheart, a disease that used to be very troublesome, and pithy stems are almost a thing of the past."

Potato Profits

(*From page* 22)

cific things which it had been hoped to learn from this three-year experiment are obscured because of the other unavoidable factors entering into the 1928 test. Because of these factors, small differences must not be interpreted as being significant.

However, all potato farmers meet with occasional bad years, and it is interesting to note what effect the different amounts of potash have on the yield of potatoes in a season when growth is checked prematurely. The largest yield under such conditions will probably be due largely to a condition causing early growth and development of the tubers. Looking at the 1928 results, it is evident that even in an extremely poor potato growing season those growers who use a high potash fertilizer, at least 5 per cent potash, will be more than repaid for the use of such a fertilizer. In this experiment, in the 1928 test, a 5-10-5S fertilizer gave a yield of 47 bushels per acre more than the plot receiving nitrogen and phosphorus but no potash. The 5-10-10S plot gave an increase of 52 bushels per acre over the 5-10-0 plot, and the 5-10-10M plot, an increase of 25 bushels per acre over the 5-10-0 plot.

Reviewing and evaluating the results for the three years, one may fairly make the following conclusions: 1, the use of at least 5 per cent potash is justified under all conditions; 2, the use of 10 per cent potash is to be recommended where potatoes are planted on land which has not been heavily fertilized with potash the preceding seasons; 3, under a system of continuous cropping, with potatoes on Long Island soils, at least 5 per cent potash should be used each year; 4, there are some lands on which 10 per cent potash would pay even under a system of continuous cropping.

The grower will do well to test the truth of this last conclusion on his own soil and under his own conditions. Ten per cent of potash will undoubtedly pay on many farms, and where it will pay, economical production demands that it be used. The role of potash in increasing the yield of potatoes cannot be ignored in this day of high labor costs and keen competition. The form of potash is probably not as important as the amount of potash. The form to be used must be determined by the relative results obtained under any given conditions and the cost of potash in each form.

Wheat

(*From page* 17)

means wheat bread, for wheat is the leading bread cereal of the moderately dry temperate climates. Because of diseases, it has never been grown extensively in humid regions. More than four billion bushels of wheat are annually grown and consumed in the world. The United States as the leading wheat country produces about one-fifth of the total acreage, which is a production somewhat in excess of domestic needs, and more than two hundred million bushels are usually exported each year.

American wheat production is of two kinds, spring and fall sown, the fall sown acreage being much the larger. The United States spring wheat belt centers largely in the region of North Dakota and states surrounding North Dakota, and extends northward into the Canadian Provinces of Manitoba, Saskatchewan, and Alberta. North Dakota is the leading spring wheat state, producing over three times the acreage of its nearest competitor, Montana. Another important spring wheat belt is found in Europe. It lies largely in Southern Russia and extends in a northeasterly direction from the Black Sea nearly to the Ural Mountains.

Winter wheat in the United States is grown in a larger number of states than is spring wheat. There are two types of winter wheat, the hard and semi-hard, the former centering in Kansas, the leading winter wheat state, and the latter in the corn belt largely east of the Mississippi River.

Over one-half of the world wheat is produced in Europe, the leading regions being southern Russia, the Danube Valley, northwestern Europe, and the countries bordering on the Mediterranean Sea. Australia and northwestern India are also important producers.

In the United States, Kansas, a winter wheat state, leads in wheat acreage, but is followed closely by North Dakota, the leading spring wheat state. The tier of states beginning with North Dakota and ending with Texas occupies America's leading wheat belt.

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24 Tons of Tomatoes

(*From page* 50)

a similar treatment. It has often been reported that no one could tell a farmer just exactly what and exactly how much fertilizer he should use on any particular crop and in any particular field. It is a matter of experimentation. Harper used the method which in the end might prove profitable on nearly any farm.

When the season's records were completed, the yield on the 2-12-8 plot was 16 tons per acre. The 2-12-12 plot produced 20 tons per acre. The 2-12-16 plot made 24 tons per acre. The fractions of a ton in each case are omitted as they were near enough alike to make little difference in the comparison.

A yield of 24 tons of red ripe tomatoes per acre looks large indeed to the average grower of tomatoes for

the canning factory. The official report that year gave 3½ per acre as the average yield for Indiana.

It only goes to show that given the right conditions, the tomato plant is capable of producing enormous tonnage. Twenty-four tons per acre is not by any means the limit as to yield. Records have been made which far surpass that. Thirty and even thirty-five tons per acre are possible and have been reported.

Good plants, placed in fertile, well-drained soil and cultivated by a man who knows tomatoes and their rooting habits will usually prove to be producers of "Apples of Gold" as tomatoes were called by the people of years ago. The amount and the analysis of the fertilizer used are but two of the problems confronting the producer of tomatoes. Even when the grower has taken every precaution known, there is a possibility of failure from unforeseen cause. Yet, year after year, the men who produce the raw material for the canned tomato continue to gamble with the crop and in the end those who study the business and attempt to improve on their practices each year will usually be found on the right side of the ledger.

Agriculture Today

(*From page 25*)

tection from fire and the harvesting of mature timber in such ways as to provide for continuous production. Watershed protection, proper use of recreational resources, and the stabilization of agricultural and other industries in and adjacent to the forests are a part of the task.

In some parts of the West, thousands of irrigated farms depend for their water supply upon the protected watersheds of the National Forests. Without the forests these farms could not exist. In other areas, hydro-electric power developments and municipal water supplies owe their security to the National Forests. On watersheds which supply water for irrigation, municipal use, and hydro-electric power, the cutting of timber and the management of grazing and other uses of the forests are conducted for the paramount purpose of safeguarding the water supply.

Where established communities and industries are dependent on the manufacture of National Forest timber, plans for harvesting the timber are made with due regard for these needs. Where the successful operation of stock raising enterprises and the use of winter pasture and feed on private lands adjacent to the forests are dependent on the availability of summer range in the forests, allotments of range under Forest permit take into consideration the desirability of stabilizing the stock raising industry of the region.

As a grazing ground, the livestock industry finds the National Forest ranges indispensable in many parts of the West. Last year, 6,394,844 sheep and goats, and 1,459,823 cattle, horses and swine were grazed under permit on the forests. When these western ranges were first included in the National Forests, many of them were in bad condition, overgrazed, and rapidly losing their capacity to supply feed for the stock.

Through research to discover what kind of stock each range is best suited for, how many animals can be grazed without injury to the forage on a particular range, and other principles of range management and administration of range resources, most of the ranges

have been restored in large measure, and the carrying capacity of many of them has been increased. Many problems remain to be solved, however, both in the management of the ranges, and in the proper correlation of grazing, timber growing, and other uses of the forests.

"The National Forests," Mr. Stuart declares, "may be considered as a group of great timber farms with many and varied resources besides the timber. The greater portion of their 159,000,000 acres of land is in the West, but they have an important and growing representation in the eastern mountain chains, the Lake States and the South, and outlying units in Porto Rico and Alaska. Their products, their protection of important watersheds, their recreational resources, and their value as demonstrations of how woodland and range can be handled on a permanently productive basis make the problem of their administration a problem of first importance to the nation.

"As a result of its 20 years' experience in handling the National Forests, the Forest Service has worked out, tested, and put into practice many principles of management that have yielded gratifying results. The chief phases of the National Forest problem which require further study involve research in fire prevention and suppression organization, methods and equipment, in timber culture and utilization, and in range and forage utilization. In a certain sense, the promotion of farm forestry and of industrial forestry, and the handling of the National Forests are so closely linked as to be essentially a single problem. This is the problem of getting from the forest land of the nation the largest possible contribution to the welfare of the people."

The Mississippi River flood disaster has raised the question as to the adequacy of the Nation's program of forestry. To control such floods solely through reforestation, however, is patently impossible in the view of forestry experts. Serious floods occurred in the Mississippi before the natural forest cover of its drainage basin had been disturbed by settlement or lumbering. The flood of 1927 was caused primarily by very heavy rains in the lower valleys, and engineering works alone can restrain the vast quantities of water poured into the channel of the river under such circumstances.

However, it is considered that forests aid in the regulation of streams, because they hold the soil in place and hold back rain and snow water more effectively than any other form of vegetative cover. Forests have a place in the plan for dealing with the Mississippi River, but one which can not be defined in sweeping or general terms. It can be determined only by study of the facts to ascertain where in the Mississippi Basin the improvement or extension of forest cover will be of tangible help in supplementing the engineering works upon which the main reliance for the control of destructive floods must be placed.

Corn Production Costs

(*From page* 28)

while costs decreased with increasing yields until with production above 130 bushels per acre, the cost per bushel was reduced to one-half (Graph). Thus it is important for corn growers to realize that expenditures for better seed, more fertilizers, or better cultural methods may be very profitable investments.

The average percentage of shelled corn was also greater at the higher yield levels, as shown in the follow-

HIGHER YIELDS INCREASED SHELLING RATIO.

Average Yields	Shelling Ratio	Per cent Moisture at Harvest
Below 70 bus	80.8 per cent	23.8 per cent
71-90	81.7 " "	25.0 " "
91-110	82.6 " "	23.7 " "
111-130	82.8 " "	23.2 " "

ing table. An increase of 2 per cent in the shelling ratio makes quite a difference in the actual yield and value of a corn crop. The percentages of moisture in the corn at harvest time did not seem to have any definite relation to the size of yields.

The combined effects of present and past soil treatments and management were stressed by Mr. Slipher as determining factors in making high or low yields. That factor of human judgment, for which there is no measurement, is probably most important. No single thing in any one year is likely to produce a phenomenal change in yields. In the past there have been waves of single practices, but soon each reached its limit of increased productiveness, because other limiting factors appeared. At certain times we particularly stressed cultivation, the use of bone dust, lime, better seed, then superphosphate, and now more nitrogen and potash. But it will be the well-balanced combination of these things over a period of years which will really do the trick of increasing yields to the maximum.

The average methods of culture and soil fertility maintenance of the corn project farmers were cited, not as exact recommendations, but merely to show what some of the best farmers have done to produce larger yields of corn.

The farmers who produced the larger yields plowed slightly deeper, cultivated a few more times, and planted earlier. The average planting date of all those fields producing from 111 to 130 bushels per acre was about May 15, while those producing less than 70 bushels planted an average of eight days later.

The fields with the highest productivity had apparently been built up in fertility by the use of more clover sods, green manures, and more fertilizers. The accompanying table shows that 80 per cent of the highest yielding corn crops were preceded by clover crops, and 30 per cent by green manures. It was also stated by Mr. Slipher that these farms in the corn contest grew one acre of legumes for each five acres of crops, while the average for Ohio is one acre of legumes for each ten acres of crop land.

More fertilizers per acre, both in the row and broadcast, were applied by the men growing the largest yields. Of course the average applications shown here are low because some used no fertilizer on corn. The general tendency is to use more complete fertilizer in the hill or row, and a phosphate-potash mixture broad-

EARLY PLANTING HELPS YIELDS

Average Yields	Depth of Plowing	Number of Cultivations		Date of Planting before or after May 15
		Harrow	Plow	
Below 70 bus	6.88 in.	1.12	2.92	8 days later
71-90 bus.	7.03	.90	2.96	3 days later
91-110 bus.	7.18	1.03	3.01	1 day earlier
111-130 bus.	7.61	1.06	3.06	0 ———

cast. The manure applications are variable because some did not use manure for the corn.

Adjusting the number of stalks per acre to the yielding capacity of the soil is one secret of getting maximum production of good quality corn. Too few stalks per acre may be the limiting factor of yields in many cases. For instance the highest yield of corn for Ohio was made with about 20,000 stalks per acre. A common practice in Ohio is to plant corn 42 inches each way, or 3,556 hills per acre. With an average stand of 2 stalks per hill this would be only 7,112 stalks, or with an average of three stalks per hill only 10,668 stalks per acre. De creasing the spacing to 38 inches each way increases the number of hills to 4,343, and with an average stand of three stalks per hill would allow 13,029 stalks per acre. The general tendency is to plant smaller varieties of corn, with more hills and stalks per acre, and consequently get more ears per acre. However, the supply of available plant foods and moisture must be sufficient to nourish the increased numbers of plants.

Since PROFIT = (SELLING PRICE — COST OF PRODUCTION) × UNITS OF PRODUCTION, each farmer should plan a 10-year fertility program to increase production per acre and reduce cost per unit. He has little control over selling price, but higher fertility of the soil gives a better fighting chance with the Weatherman.

GOOD SOIL MANAGEMENT IS REWARDED BY INCREASED YIELDS

Average Yields	Clover sod plowed	Green Manured	Ave. Tons Manure per acre	Fertilizers Applied Row	Broadcast
Below 70 bus.	64%	22%	4.04 T.	50 lbs	158 lbs.
71-90	86	22	3.65	49 lbs.	145 lbs.
91-110	72	22	2.70	55 lbs.	148 lbs.
111-130	80	30	3.80	61 lbs.	184 lbs.

Jupiter Pluvius—Thief

(*From page* 16)

the rate of 566 pounds per acre.

Of course, it is impossible to sod our agricultural districts, so we must do the next best thing. This question of sodding and its cutting down our soil erosion points out that the farm lands during the time they are idle in the fall and winter, if possible, should be in a cover crop. If this cannot be done, then the land should be left in a rough state in order that the moisture which falls on it will be held to soak in. Where the rainfall is so heavy that the soil has not sufficient capacity to take it all in, the rough state is only a help and not a final cure.

Another important thing too frequently overlooked is the direction of cultivation. Too many of our farms have the rows running up and down hill and are cultivated in that direction. This means that each row becomes a drainage channel in which the water will run at high speed taking soil with it. In other words, it is almost an ideal condition for the maximum soil erosion. The proper method to pursue in placing the rows in order to minimize soil erosion and the loss of soil moisture is to run the rows with the contour of the land, that is, the

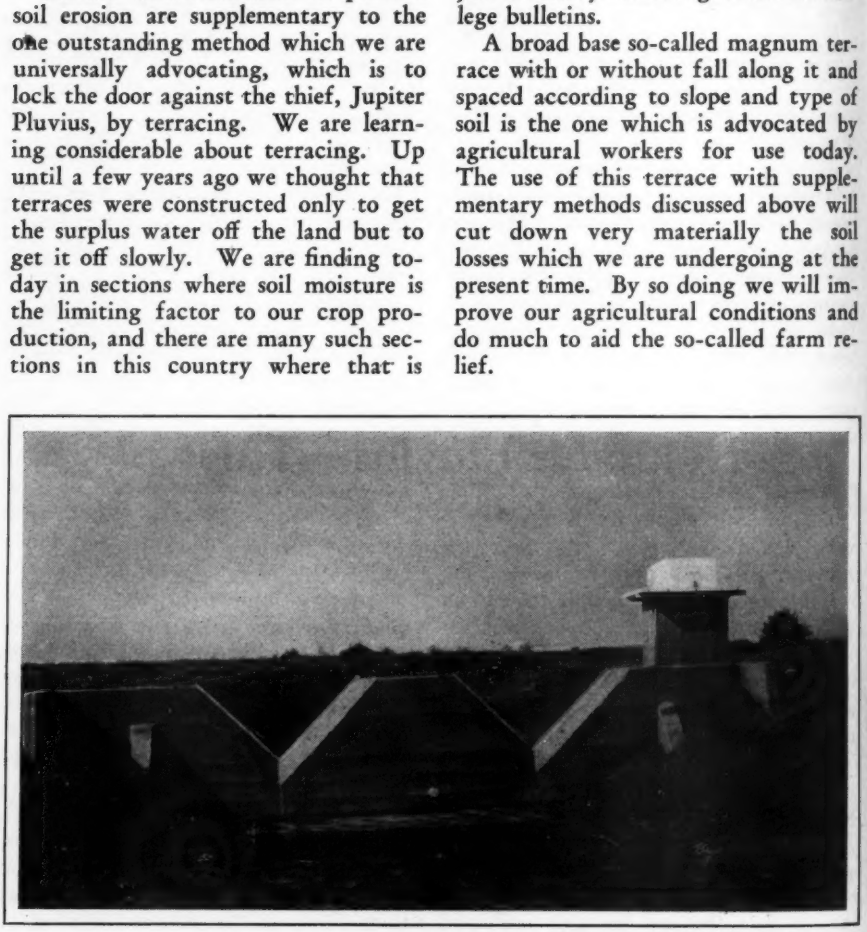
rows should be run practically without any fall along them.

The soil fertility should be built up as fast as possible because rich soil which is full of humus erodes more slowly. The Missouri work clearly demonstrated this, for by crop rotation only, yearly soil losses were reduced from over 17 tons per acre to less than 3. This fact has resulted in the axiom which most terracing experts give that you should terrace your best land first. It is not only easier to hold the water on it, but it naturally follows that you want to hang on to what you have while you have it.

All the above methods to prevent soil erosion are supplementary to the one outstanding method which we are universally advocating, which is to lock the door against the thief, Jupiter Pluvius, by terracing. We are learning considerable about terracing. Up until a few years ago we thought that terraces were constructed only to get the surplus water off the land but to get it off slowly. We are finding today in sections where soil moisture is the limiting factor to our crop production, and there are many such sections in this country where that is true at least sometime during the year, that terraces conserve moisture. We are going to learn more about that as time goes on. There is no doubt that up to the present time terraces are our best known device for the handling of soil erosion. They at best are none too good and I feel in the future we are going to learn much about them.

It is remarkable that terraces have come up through these many years with as little research attention as they have had. The result of it is that they have just grown like Topsy. The terrace, its construction, its location, design, and method of handling is a subject of many State Agricultural College bulletins.

A broad base so-called magnum terrace with or without fall along it and spaced according to slope and type of soil is the one which is advocated by agricultural workers for use today. The use of this terrace with supplementary methods discussed above will cut down very materially the soil losses which we are undergoing at the present time. By so doing we will improve our agricultural conditions and do much to aid the so-called farm relief.



One of the several large concrete weirs and gauging stations on the Spur, Texas, Experiment Station run-off water project.

Ennui

(*From Page* 4)

game of ball. Consider two kinds of people present—one being a hard pressed player who welcomes a little time out, and the other being a bored spectator who doesn't know the rules or care for the sport.

There you have one clear illustration of the two opposite brands of ennui. The lively player is fatigued and wants a little rest and change of position, a chance to relax and recuperate. To him a brief rest is that much restoration so he may *renew* the heated strife.

The indifferent spectator has no issue at stake, has made no preparation, is perhaps only half awake—just waiting idly for the finish. Thus likewise do we all sometimes experience the lethargy that men call ennui for want of a better term. Which kind have you? The refreshing or the deadening variety? The kind that has come from sacrifice or the kind engendered by selfishness? I hope that your answer is that you are more often mentally or physically lazy than stagnant, morbid, or steeped in dull despair.

TOO much introspection or faulty digestion brings on the state best set to music by the "blues." Ultra selfishness is a frequent product of ultra modernity. Such folks are dissatisfied, bored, and unhappy and they know not why. They have drifted into the doldrums of dull irrationalism, swept by no breeze of enthusiasm or fanned by no zephyr of zest.

Remember Maeterlinck's dream children who sought the elusive bluebird of happiness? The end of their quest is just as true outside of fairy tales. It is this:

We find pure happiness in things which depend upon ourselves, and we fail to find happiness when we depend entirely upon things which are at the mercy of circumstances.

When I went to school Psyche was a pictured goddess, or something, found in the pages of a musty mythology text-book. Nobody paid much attention to her except to notice her lack of stays and a bustle.

But today I cannot scan a paper or go down the street without reading the professional card of some nerve specialist—a psychoanalyst who has a long-time treatment on tap for the myriads of the self-inflicted sufferers.

As I am very much interested in other folks and cannot keep my mind completely self-centered, it may be that I shall never see the inside of those consulting rooms. I shall no doubt continue to have ordinary plebeian ailments, like toothache and ingrowing toe-nails, rather than indulge in those modish maladies in a class with neurasthenia, dementia praecox, and hypochondria.

BE that as it may, I can partly sympathize with those patients, for their inertia is as real to them as my indefatigable energy is to me. The only difference is that I get a rest sometimes, and they don't. The nerve expert knows better than to let them!

This sort of disposes of the listless-spectator form of inertia, and brings us full steam ahead to the kind that gets most of us sooner or later.

The widening distance between the centers where decisions are taken and the places where the main work of the world is done has undermined the discipline of public opinion. In our grandfathers' time the model of popular government was the self-sufficing township in which the voter's opinions were formed and corrected between himself and his neighbors.

But now, as Walter Lipmann says,

we are "absentee rulers," or a kind of phantom public, who are expected to be on the inside of things, while we are really on the outside. The "public" consists of you and me and all the others who pay taxes but hold no office. Executive action is not for us; the real merits of a public question cannot reach us; we lack the time or opportunity for analysis or solution of the problems; and so all we can do is to spit on the stub pencils they give us on election day, and take another chance!

THIS brings me at last to Jim Yancey's Dixie mule, addressed by his forlorn, debt-ridden driver in this fashion:

"Bill, you are a mule, the son of a jackass, and I am a man, made in the image of God. Yet here we work hitched together! Do you work for me, or I for you? Perhaps it's only a mule and a fool, after all. You work on four legs and I on two, so mathematically speaking, I do twice as much work as you. When the corn is harvested I give one-third to the landlord, the other third goes to you, and what's left is my share. But while you eat all your share except the cobs, I divide mine among one wife, seven kids, three cows, sixteen hens, and a banker! Bill, you *are* getting the best of me. About the only time when I'm better than you is on election day, for I can vote and you can't. But if I get any more out of politics than you do, I fail to see it yet!"

Jim Yancey's power as an atom of the phantom public is about like yours and mine. But he is happy in his ennui, while we on the contrary, strive to be "up on" everything, and consequently get the "low down" on nothing.

Trying thus to keep our place in the sun of public opinion and aiming hard at every mark—this is the settled job of every self-respecting citizen who wishes to be counted among the intelligentsia, otherwise known as the cognoscenti.

I therefore offer some of my most recent attempts to escape inertia and ennui by "widening my horizon." If you are also a well-read man, it will be no hardship to get my drift and float along with me.

The tariff should be lowered on blackstrap molasses, circular saws, and saxophones, and we ought to protect the infant industries by higher duties on teething rings and toys. After cogitation over several littered digests I am ready to toast Mr. Kellogg for being well posted. That means I am for multilateral treaties, not too badly mutilated.

I have delved rigorously into some correspondence on the construction of cruisers which sets forth some of the conflicts (not at sea) between the statistical claims of the National Council for the Prevention of War and the officials of the U. S. Navy. Added thereunto and duly subscribed are remarks by the Honorable David I. Walsh of Massachusetts in the Senate assembled on January 30, 1929. Appended thereunder are more remarks in "five point solid" by Honorable Gerald P. Nye of North Dakota, entitled "We don't need fifteen more cruisers at Fargo or Bismarck."

WITH a trace of eclat and some little unction thrown in, I scan the list of capital ships, airplane carriers, destroyers, submarines, mine layers and monitors—and find a horrid discrepancy between the figures submitted by the lady associate secretary of the anti-cruiser crusaders and those so deftly presented by the rear admiral's ensign extraordinary. To whom should this be reported, and if so, what for?

Looking at my thermostat I decide to keep cool in memory of Coolidge and not rock the boat. (This is my first remote hint of the oncoming, insiduous ennui.) If everybody's trying as hard as I am to be patriotic, we shan't need Borah to protect the constitution.

Next I am sought by the literature of the People's Hobnobbing Lobby, and I am showered with pamphlets which seek to arouse me and make me ashamed of my country and its crass cupidity. I get eighty-five questions and their correct answers printed on a formal looking sheet, and it also is part of my duties as a citizen to peruse them.

I learn that thirty-nine people own and control one-sixtieth of the total wealth of the country and that they have at last prevailed upon America to adopt the slogan "milk from contented cows" as the safe and sane dictum under which to perpetuate their income.

On top of this comes more revelations of the public utility propaganda, and I am obliged to compare Ontario power rates with those in my home state in order to get a shock over the price of volts. If this keeps up I may decide it is cheaper for us to do our reading out in the sedan with the dome light turned on.

For a moment now I dip into history to fortify myself as to the methods of serious crusaders, and I am secretly overjoyed to detect that these helmet-crowned knights were not all cultured or inspired, and that half of them were adventurers while the other half didn't know what it was all about! Yet have some modern reform waves produced much better material?

ALMOST in despair at escaping the grip of ennui, I turn to education for relief, and find it a jungle of jargons, with no interpreter. Furthermore, as fast as they print books something occurs to make them obsolete, and every scientist is trying to disprove what the other one has published.

Yet haven't they told me for years that the only way to take the mass out of the morass would be to give the proletariat more pedagogues?

Neither do I acquire more confidence from the moralist, for I often find him perturbed over the thermal units in Hades. And again, what profit lies here to strengthen my industry, for what is a capital crime in my neighborhood is only a postponed case in Chicago.

If erudition and morality combined cannot keep me mentally awake, then surely my last resort rests on competition.

If and when I do some work, however unimportant, that somebody else may be doing a trifle better; if and when I resolve to excel that other laborer at his own game without malice or trickery; then I am apt to find the force that is latent within me to ward off deadening decadence.

So it is that I am able to shun the ennui that injures and enjoy the occasional kind that soothes and restores. I must get used to being ignorant on many things and wise to a few. I don't want anybody to call me a specialist or an expert—except in hard work and happiness.

THE recipe for the utmost happiness must include a dose of reverie and restful idleness. Most folk wait until midsummer to take that part of the recipe, only to find resort rates too high. If you are like me, however, you cannot escape it in April. After a long season of steam-heated, high-pressure, indoor production, how I welcome a chance to lie back and *quit thinking!* In the midst of this confinement and grind, how delicious it is to cease using my brain!

And so in reading this you have had to take the consequences. If, peradventure, I have convinced you that spring fever is as much a sanitary thing as spring house-cleaning, and that it does as much for the so-called human race as the entire brigade of scrub women, then my spell of word wrestling has been effective.

Call it April, spring fever, or ennui —what you will! But do not call me back to work until it's over.

THE FORD THRILL

Her lips quivered as they approached mine. My whole frame trembled as I looked in her eyes. Her body shook with intensity as our lips met, and I could feel my chest heaving, my chin vibrating, and my body shuddering as I held her to me.

The moral of all this is: Never kiss them in a Ford with the motor going.

"Hello, Jake," said the farm hand. "Why aint you comin' to the weekly dances down at the range hall?"

"Ho, ho, dances!" said Jake. "I could never learn to dance."

"You could, too. It's dead easy," replied the farm hand. "All you got to do is to keep turnin' around and wipin' yer feet."

"I want to get a good novel to read on the train—something pathetic," said the woman to a book salesman.

"Let me see, how would 'The Last Days of Pompeii' do?" asked the salesman.

"Pompeii? I never heard of him. What did he die of?"

"I'm not quite sure, ma'am," replied the salesman, "some kind of eruption, I believe."

'STAT SO?

Teacher: "How did Staten Island get its name?"

Wise Pupil: "A German was coming to America, and when he saw land, he said, 'Staten Island?' "—*Exchange.*

ONE THING AT A TIME

A friend dashed up to the cabin to say: "Oh, Mrs. Jones, your man done got in a fight and got hisself killed." Mrs. Jones was busy eating a juicy piece of pig's feet and kept on chewing. "Lawsy, Mrs. Jones, that's terrible. Ain't you going to take on about it?"

"Just wait till I finish this here pig's trotter and you'll hear some hollerin' as is hollerin'."

One day when Mr. Gladdis was golfing, he discovered an old lady calmly seated on the grass in the middle of the fairway. "Don't you know it is dangerous for you to sit there, Madam?" he reminded her. The old lady smilingly replied, "It's all right; I'm sitting on a newspaper."

LOAN DELAYED

"Hello! Hello! Is this you Mac?"

"Aye."

"Is this Mac MacPherson I'm talking to?"

"Aye; spekin'."

"Well, Mac, it's like this: I want to borrow $50—"

"All right. I'll tell him as soon as he comes in."

METER NEVER STOPPED

Professor: "Go your fastest, my man! I am in a desperate rush."

Taxi Driver (after speeding along for thirty minutes): "Say, you forgot to tell me where we are going!"

"Corn Seed Treatment Can Be Recommended"

Says Illinois Agricultural Experiment Station

REGARDLESS of the care taken in selecting seed corn and the price paid, seed may be diseased with one or more of the root rot organisms. This has been proved conclusively by the Illinois Agricultural Experiment Station, which reports: "No seed corn of which there is enough for farm use is entirely free from disease. Even though seed is carefully tested in a germinator, the best name that can be applied to it is 'nearly disease-free.' The average farmer's seed is rather badly diseased. This causes a big decrease in yield which the farmer can ill afford."

Since the most carefully selected seed is subject to contamination by soil borne organisms, the best practice to assure a good crop is to treat all seed corn, both tested and untested, with Semesan Jr.

That seed treatment pays handsome profits is the conclusion reached by Dr. Benjamin Koehler and Dr. George H. Dungan of the Illinois Agricultural Experiment Station who cooperated in extensive tests with Dr. J. R. Holbert of the U. S. Department of Agriculture.

In the Forty-First Annual Report of the Illinois Experiment Station, these authorities say: "Seed treatments with the right fungicides for the control of corn rot diseases are paving the way to increases in yield and it is becoming evident that this practice should be recommended to farmers. Although treating good seed usually swells the yield only a few bushels an acre, this increase is practically clear profit, since the cost of the chemical used is only 2½c. an acre."

U. S. Dept. of Agriculture Circular 34 reports that Semesan Jr. gave average increased yields of 1.9 bushels per acre with nearly disease-free seed, and 12 bushels with diseased seed. Reports from corn growers in many states show other yield increases even greater than those reported in that Circular.

Field tests on farmers' seed box corn show that untreated seed produced only 33.0 bushels per acre compared with 54.7 bushels from Semesan Jr. treated seed of the same lot.

Other Du Bay Seed Disinfectants are: Ceresan, for seed grains; Semesan Bel, for seed potatoes; and Semesan, for vegetable and flower seeds and bulbs.

SAMPLES FURNISHED

Plan your seed treatment projects now. We will furnish gratis samples of any or all of our disinfectants to those Cooperative Agricultural Extension and Vocational Agricultural Workers who will plant demonstration plots of treated and untreated checks and report to us the results of disease control and yield increases. Send a list of crops to be treated with request for samples and descriptive literature to Bayer-Semesan Company, Inc., 105 Hudson Street, New York, N. Y., successor to Seed Disinfectants Divisions of E. I. du Pont de Nemours & Co., Inc., and The Bayer Company, Inc.

DU BAY

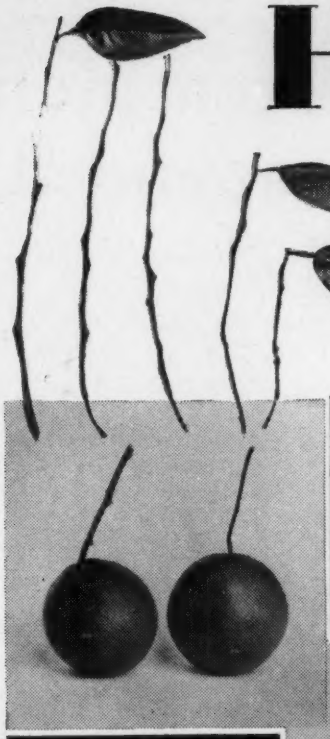
Seed Disinfectants

SEMESAN JR.

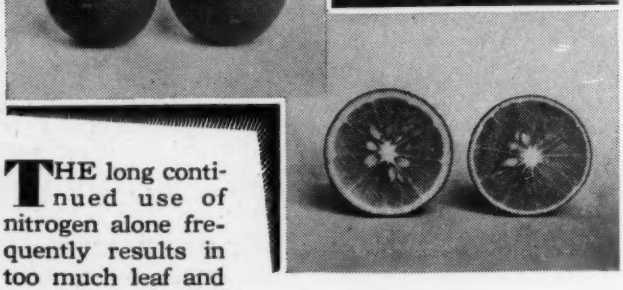
REG. U. S. PAT. OFF.

Dust Disinfectant for Seed Corn

How Potash Helps



POTASH pays in extra yields and extra quality. Bearing citrus trees should receive 2 to 3 pounds of actual potash (K_2O) per year, preferably in a mixed fertilizer. However when nitrogen and phosphoric acid are otherwise amply provided, straight Sulphate of Potash can be applied at the rate of 4 to 6 pounds per tree. This may be divided into two applications—the first in early spring, the second in late summer or early fall.



THE long continued use of nitrogen alone frequently results in too much leaf and wood growth and a poor set of fruit of a coarse and poor quality. This is illustrated in the wood and fruit at left in the photographs above. Phosphoric acid and potash used with nitrogen in a complete fertilizer produce well-developed fruiting wood, finer foliage and better quality fruit. This is illustrated at right in the above photographs. Potash produces fruit with a thinner rind, better shape, finer flavor, firmer texture, and better keeping and shipping qualities.

Agricultural and Scientific Bureau

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San Jose, Calif.

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POTASH PAYS

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